WATER and RELATED LAND RESOURCES

EL RIO EN MEDIO SUB-BASIN
UPPER RIO GRANDE BASIN

NEW MEXICO

Elephant Butte Reservoir

SCS PHOTO 12-P992-11

PRELIMINARY
EARLY ACTION OPPORTUNITIES

A Report Based on a Cooperative Study by

THE UNITED STATES DEPARTMENT OF AGRICULTURE

and the

NEW MEXICO STATE ENGINEER

PREPARED BY
SOIL CONSERVATION SERVICE - ECONOMIC RESEARCH SERVICE - FOREST SERVICE
ALBUQUERQUE, NEW MEXICO 1970

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PRELIMINARY REPORT

EL RIO EN MEDIO SUBBASIN, UPPER RIO GRANDE BASIN, NEW MEXICO

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EL RIO EN MEDIO SUBBASIN PRELIMINARY REPORT

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PRELIMINARY REPORT

EL RIO EN MEDIO SUBBASIN

UPPER RIO GRANDE BASIN

NEW MEXICO

PREFACE

This report is the third of four preliminary reports about the Upper Rio Grande Basin. It deals with water and related land resource problems and project opportunities in "the Middle River" area and suggests available United States Department of Agriculture programs that can be used to alleviate the problems. These are project opportunities that should be initiated in the next 15 years.

The four reports contain early action recommendations for (1) the Chama-Otowi Subbasin, (2) El Rio Arriba Subbasin (the "Upper River" area), (3) El Rio en Medio Subbasin (the "Middle River" area), and (4) Estancia Subbasin.

The final basin report will include early action recommendations compiled from an assessment of the project opportunities and appraisal of needs to support requests for early action basin-wide project authorization.

I. INTRODUCTION AND SUMMARY

Purpose, Objectives, Authority, and Scope of Study

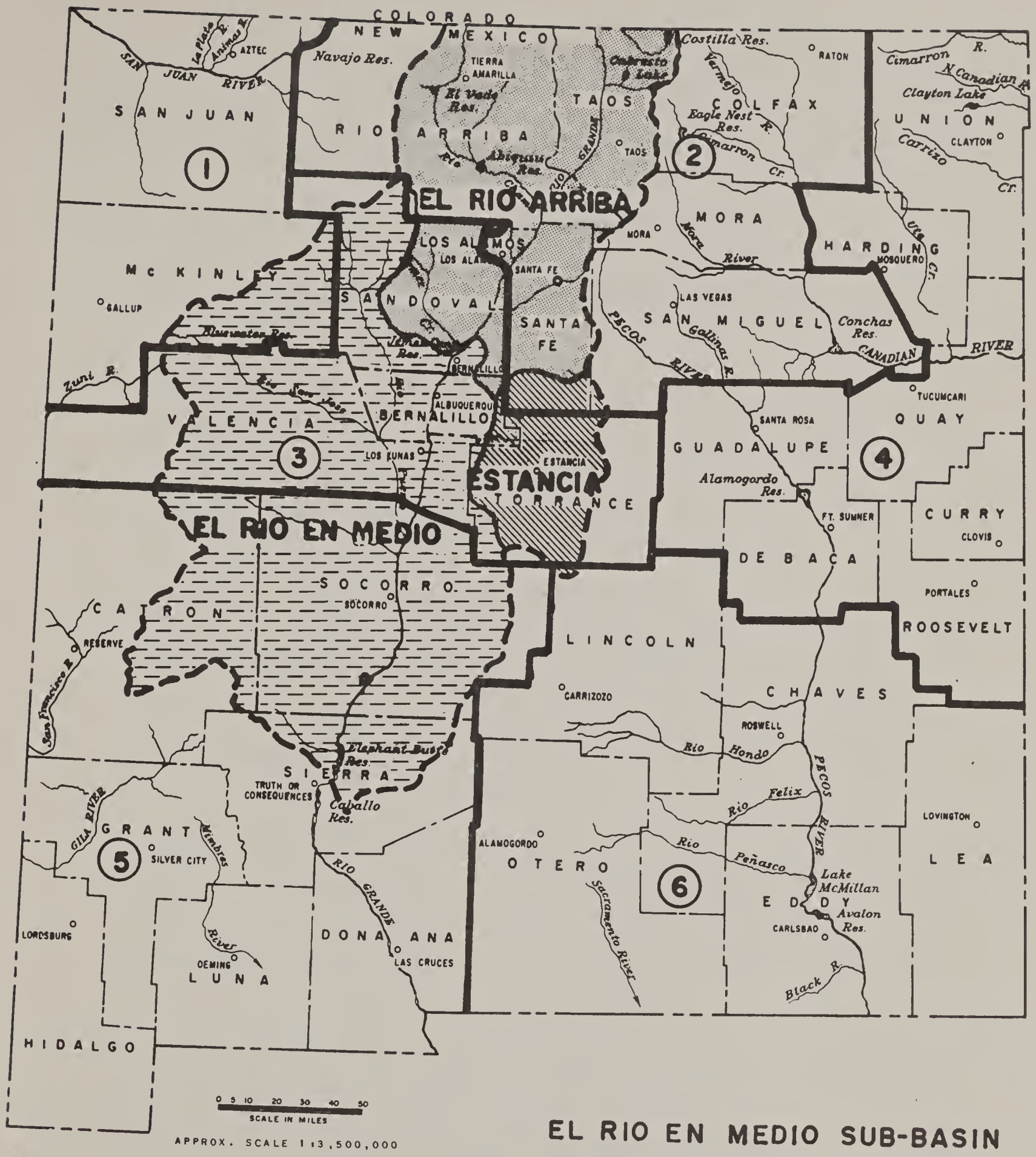
The purpose of this report is to summarize the problems, needs and development opportunities of water and related land resources that need immediate attention in the El Rio en Medio Subbasin of the Upper Rio Grande Basin, New Mexico.[1/] Identified are problems concerning the conservation and use of land and water. Various solutions are suggested through cooperation in programs of the United States Department of Agriculture and other federal and state agencies.

The office of the New Mexico State Engineer (the sponsoring and cooperating agency) requested the United States Department of Agriculture to conduct a study in the Upper Rio Grande Basin. This study has been made under the authority of Section 6 of the Watershed Protection and Flood Prevention Act of the 83rd Congress (Public Law 566, as amended) which authorized the Secretary of Agriculture to cooperate with other federal, state and local agencies to develop coordinated programs. It is in compliance with the decision of the field advisory committee to release information on opportunities to solve problems that local people could launch immediately.

Emphasis is placed on opportunities for project-type developments through initiative of local sponsors. Developments under the provisions of the Watershed Protection and Flood Prevention Act (Public Law 566, as amended) are an example. Other opportunities such as farm and ranch development planning measures exist for individual and group developments. Eligible for United States Department of Agriculture technical and financial assistance are programs designed to cope with problems of land use and treatment, flood prevention, agricultural water management, municipal and industrial water supply, water quality management, recreation, and fish and wildlife.

In this cooperative survey report, it is recognized that social, institutional, legislative, and economic considerations may impede some recommended developments and increase the interest in others. These factors may establish the need for studies beyond the scope of this survey. These programs are treated only to the extent of discussing impacts, both adverse and beneficial, of recommended developments and their capability of meeting projected demands.

1/ The term "related land" as used here refers to land that is associated with water resources developments either through the effects of the land on the water resources, or the effects of the water resources and their developments on the land.



0 5 10 20 30 40 50
SCALE IN MILES

APPROX. SCALE 1:3,500,000

LEGEND

- STATE LINE
- COUNTY LINE
- UPPER RIO GRANDE BASIN
- DISTRICT BOUNDARY
- SUB-BASIN
- (2) DISTRICTS

N

EL RIO EN MEDIO SUB-BASIN
UPPER RIO GRANDE BASIN
STATE OF NEW MEXICO
PLANNING AND DEVELOPMENT DISTRICTS

Attention is directed to programs, projects and measures needed within the next 15 years. The report provides local people, the state of New Mexico, and federal agencies with possible courses of action (1) for the development, conservation, and use of the natural resources, and (2) to improve the economic and social opportunities for the people.

The basin study has the following five principal objectives:

1. To identify broad areas apparently feasible for land treatment with USDA project-type programs, and to appraise the economic effects of such practices.

2. To provide a technical basis for more effective coordination of USDA programs for watershed protection, flood prevention, agricultural water management, environmental quality, and related purposes with similar activities of local, state, and other federal agencies. Information would be assembled and developed on water and related land resource use and management, with particular regard to multiple-use.

3. To identify and describe the opportunities to assist in improving the agricultural economy of the basin through the use of small watershed projects under Public Law 566 that would be coordinated with other existing and projected developments.

4. To appraise the opportunities of meeting local water and related land objectives through existing or other USDA project-type programs as may become available.

5. To appraise the agricultural, rural community, and upstream watershed needs of the basin and to prepare a plan for the coordinated and orderly control and regulation, management and use of the water and related land resources to satisfy those needs to the extent feasible in the entire basin which includes such structural and associated land treatment measures as should be provided in the next 10 to 15 years.

The majority of these project measures can be developed under programs of the United States Department of Agriculture or programs in which USDA agencies can participate. The opportunities include (1) items on which project-type action is the best means of accomplishing the objectives, (2) programs to be carried out entirely by an agency of the U. S. Department of Agriculture, and (3) treatment measures to be carried out by land administering agencies and private landowners. All of the measures could come under authorities of the Resource Conservation and Development Act, Public Law 87-703. The projects and measures, where noted, are interrelated with project developments proposed by other agencies.

Problems Needing Early Action

Problems needing study and project action in the next 15 years can be grouped into seven general categories:

1. Water management problems including drainage, water availability, irrigation water management, and phreatophytes.

2. Floodwater, erosion, and sediment damage.

3. Field experimental work needs to be done to quantify the effects of vegetative manipulation.

4. Agricultural production hampered by (1) poor range management, (2) poor management and utilization of private forests, (3) inadequate marketing and processing facilities.

5. General economic problems such as high unemployment, low income, a high percentage of people on welfare, uneconomical operating units, tenancy, and lack of adequate credit.

6. Lack of adequate recreational facilities.

7. Environmental quality problems such as inadequate sewage and water systems and solid waste disposal.

Findings and Conclusions

1. Thirteen watersheds in the area have potential for development. Watershed investigation reports for these watersheds have been developed and are contained in the appendix of this report. Average annual costs for these watersheds would be $1,767,800 for 71 floodwater retarding structures and 360,000 linear feet of floodwater diversions. Average annual benefits would be $3,891,600. The overall benefit-cost ratio for the thirteen watersheds is 2.2 to 1. The proposed structures would control 1,372 square miles or 878,000 acres.

2. Community water systems are needed in 6 of 39 communities of over 100 persons population. Community sewage systems are needed in 21 of 37 communities. For the early action period, the costs for water and sewage are estimated:

Total cost	$100,046,000
Federal cost share	3,194,600
State financial assistance	240,000
Local peoples' share	96,612,000

Analysis of groundwater resources indicates an adequate supply underlying 36 of the 39 communities. The communities of Acoma Pueblo, Tijeras, and Magdalena need detailed studies to determine if adequate groundwater can be developed for the 1980 projected population. Many of the communities are located in a declared water basin and must comply with the regulations applying to the appropriation and use of underground water.

3. Population increase will increase municipal and industrial water needs. The population by 1980 is estimated to be 599,550 as follows:

Rural	33,120 (8% increase)
Municipal	566,430 (68% increase)

The average daily requirement and depletion of water by municipalities and industries by 1980 is estimated to be:

	Average daily requirement (acre-feet)	Average daily depletion (acre-feet)	Increase requirement (acre-feet)	Depletion %
Municipal	330.30	199.92	106	131
Rural	6.10	4.07	23	17
Industrial	181.24	26.42	-	-
Power	1801.67	36.12	-	-

4. Fourteen resource conservation and development type studies are proposed. These project measure suggestions include intensive land treatment, expanded agricultural production and marketing, associations for production and marketing, community facilities, transportation, and recreation facilities.

5. Vegetative manipulation is needed to increase the water yield but more experimental data is needed in order to quantify the effects.

6. Irrigation system improvement is needed on 60,000 acres of irrigated cropland. Associated with this are 28,000 acres of land that need subsurface drainage.

7. Early action land treatment needs are identified as:

Critical area management	1,785,000 acres
Good range management	2,913,000 acres
Abandoned cropland treatment	11,000 acres
Pinyon-juniper control and management	2,140,000 acres
Sagebrush control and management	78,000 acres
Mesquite control	75,000 acres
Chaparral control and management	24,000 acres
Rabbit brush control and management	36,000 acres
Bottomland vegetation control and management	43,000 acres
Commercial forest land management	226,000 acres

Approximately 50 percent of the subbasin's soils are subject to extreme erosion when vegetative cover is disturbed.

The total estimated cost for land treatment in the subbasin is $74,685,000 including $11,350,000 on thirteen watersheds identified for the early action program. This cost converted to an annual equivalent is $6,600,000 and produces estimated average annual returns of $14,680,000. This land treatment activity will create an additional 560 man-years of employment for the area annually.

8. Recreation visitor day use is projected to double by 1980. Existing and planned recreational developments will be adequate to satisfy the estimated needs of the subbasin for 1980.

9. National Forests (Santa Fe and Carson) are significant in the area. Project work inventories (listing of non-recurrent work) identify 12 distinct types of resource conservation and development needs. The total estimated cost for this work is $50,800,000.

10. The early action opportunities identified in this report (primarily for watershed protection and flood prevention on thirteen watersheds) would have average annual costs of $8,367,800, would produce estimated average annual benefits and returns of $18,571,600 and provide 704 average annual man-years of additional employment. This additional employment would add an estimated $2,816,000 annually to the economy of the area.

Erosion scars on Acoma Creek Drainage SCS PHOTO 12-P992-9

Description of Study Area

Physical Features

El Rio en Medio Subbasin of the Rio Grande Basin is located in Central New Mexico. "El Rio en Medio" is the Spanish language expression for the "Middle River". The area includes all or portions of McKinley, Torrance, Valencia, Bernalillo, Socorro, Catron, Rio Arriba, Sierra, and Sandoval Counties. The study area is about 170 miles long and 106 miles wide. It is bounded on the east by the west slopes of the Jemez, the Sandia, Manzano, and San Andres Mountain ranges and on the west by the Continental Divide. The San Felipe stream gage on the Rio Grande is the north boundary. The gage is located 21 miles north of Albuquerque at the San Felipe Indian Pueblo. The subbasin extends south to Elephant Butte Dam.

The drainage pattern is to the south. Sea level elevations range from 5,120 feet at the San Felipe stream gage and about 4,600 feet at Elephant Butte to about 11,390 feet on Mount Taylor in the San Mateo Mountains.

There are about 11,802,200 acres (18,161 square miles) in the study area. Approximately 17 percent of this land is privately owned, 16 percent is state land, and 9 percent is Indian land. Fifty-eight percent of the land is administered by federal agencies [16 percent (1,561,000 acres) Forest Service, 37 percent Bureau of Land Management, 5 percent National Parks, military reservations, and wildlife reservations].

The subbasin includes many small communities and a few larger cities. The larger cities are Albuquerque, Bernalillo, Belen, Los Lunas, and Socorro. Of these, Albuquerque is the largest and is the main trading center of the area.

The topography varies from steep, very rough, mountainous terrain to nearly level mesas and broad flat river bottoms.

There are about 95,000 acres of land under irrigation systems, 804,000 acres of commercial forest, 3,819,000 acres of woodland, 1,237,000 acres of brushland, 5,269,000 acres of grassland, 80,000 acres of bottomland vegetation, and 232,000 acres of land for miscellaneous use in the subbasin.

The subbasin includes parts of the (1) Southern Rocky Mountains Physiographic Province, (2) the Navajo section of the Colorado-Plateaus Physiographic Province, and (3) the Mexican Highland and Sacramento Section of the Basin and Range Physiographic Province.

The soils are closely related to the geologic patterns. Most soils are immature and have physical characteristics obviously influenced by the associated rock formations. Rocks range in age from Recent to Precambrian and include sedimentary, metamorphic, and igneous types.

Soils range from:

dense clays developing on soft shale to --

SCS PHOTO 12-P993-4

-- active sand dunes blown from stream channels

SCS PHOTO 12-P1001-8

Badlands west of Bernalillo. Sediment source areas like this help fill stream channels and muddy irrigation water. SCS PHOTO 12-P990-6

The soils occurring in the New Mexico-Arizona Plateaus and Mesas Land Resource Area (see Land Resource Area Map) play a most important part in the basin economy and environment. These soils are developing primarily in the highly erosive materials of the Santa Fe geologic group and contribute a large percent of the damaging sediments of the subbasin.

The subbasin is traversed by Interstate Highways 25 and 40 and U. S. Highways 380 and 60 which are the main arteries of travel. Numerous state and county highways provide access to most of the study area.

The Atchison, Topeka and Santa Fe Railroad ties the study area to eastern and western states.

The climate varies from severe winter weather with heavy snowfall in the high mountains to a temperate semi-arid climate in the lower regions. Recorded temperatures range from a high of 106 degrees to minus 40 degrees Fahrenheit.

The average annual precipitation above the 8,500 foot elevation is about 18 inches of which about half is snowfall and half is summer rainfall. At lower elevations the annual precipitation ranges from about 6 to 12 inches and usually falls during summer thunderstorms. (For more climatic data see table 1).

Table 1, Typical climatic conditions by land resource areas in the El Rio en Medio Subbasin, New Mexico, for length of record

Station	Length of record (years)	Elevation (feet)	Precipitation: Mean annual (inches)	Precipitation: October-March inches	Precipitation: October-March % of annual	Mean annual temperature °F.	Minimum temperature °F.	CIR 2/ (inches)	Frost-free period: From	Frost-free period: To
NEW MEXICO AND ARIZONA PLATEAUS AND MESAS LAND RESOURCE AREA (WP)										
Cuba	22	7045	13.79	8.64	62	46.5	-40	1.11	6/7	9/20
Regina	1/	7450	15.86	6.76	42	45.4	-30	-	6/3	9/25
Johnson Ranch	16	7200	10.53	4.19	39	-	-	-	-	-
Thoreau	7	7120	10.29	4.12	40	-	-	-	-	-
Lee Ranch	10	7200	8.25	2.85	34	-	-	-	-	-
Grants	14	6520	8.83	2.80	31	-	-	1.64	5/21	10/12
San Fidel	38	6100	9.85	2.83	28	51.5	-20	1.64	5/2	10/18
Laguna	48	5815	9.86	3.06	31	53.4	-20	1.64	5/25	10/20
Hickman	13	7890	8.68	3.22	37	-	-	-	-	-
Augustine	1/	7025	10.51	3.21	30	47.9	-26	-	5/25	9/30
Magdalena	56	6556	11.86	3,43	28	52.1	-21	-	5/1	10/15
Danley Ranch	21	6800	9.75	2.87	29	49.6	-12	-	-	-
SOUTHERN DESERTIC BASINS PLAINS AND MOUNTAINS LAND RESOURCE AREA (SD)										
Bernalillo	36	5060	8.41	3.29	39	54.5	-18	1.95	5/3	10/10
Albuquerque	1/	5314	8.13	2.86	35	56.6	-13	2.01	5/3	10/12
Los Lunas	63	4885	8.07	2.82	34	-	-	2.11	5/3	10/15
Belen	17	4800	7.01	2.73	28	56.6	- 7	2.22	4/22	10/17
Socorro	1/	4617	8.75	2.62	29	58.4	-16	2.11	4/14	10/28
Bosque del Apache	1/	4520	7.79	2.54	31	58.2	- 9	2.10	4/13	10/24
Engle	29	4770	9.14	2.61	28	-	-	-	-	-
Elephant Butte Dam	76	4576	8.55	2.53	29	61.2	- 5	2.57	3/27	11/12
PECOS-CANADIAN PLAINS AND VALLEYS LAND RESOURCE AREA (CP)										
Bingham	21	5453	9.07	2.77	31	55.5	- 8	-	5/3	10/22
ARIZONA-NEW MEXICO MOUNTAINS LAND RESOURCE AREA (RM2)										
Marquez	19	7620	11.79	3.97	33	-	-	-	-	-
Kelly Ranch	16	6700	13.86	4.08	29	-	-	-	-	-
Rienhardt Ranch	10	5450	8.05	2.17	28	-	-	-	-	-

1/ Normal based on 1931-1960 records
2/ CIR - Consumptive Irrigation Requirement

Source: Consumptive Irrigation Requirements of Selected Irrigated Areas in New Mexico, NMSU Ag. Exp. Sta. Bulletin 531

Land use varies from --

-- rich bottomland irrigated farms to --

SCS PHOTO 12-P991-10

-- sparsely vegetated rangeland

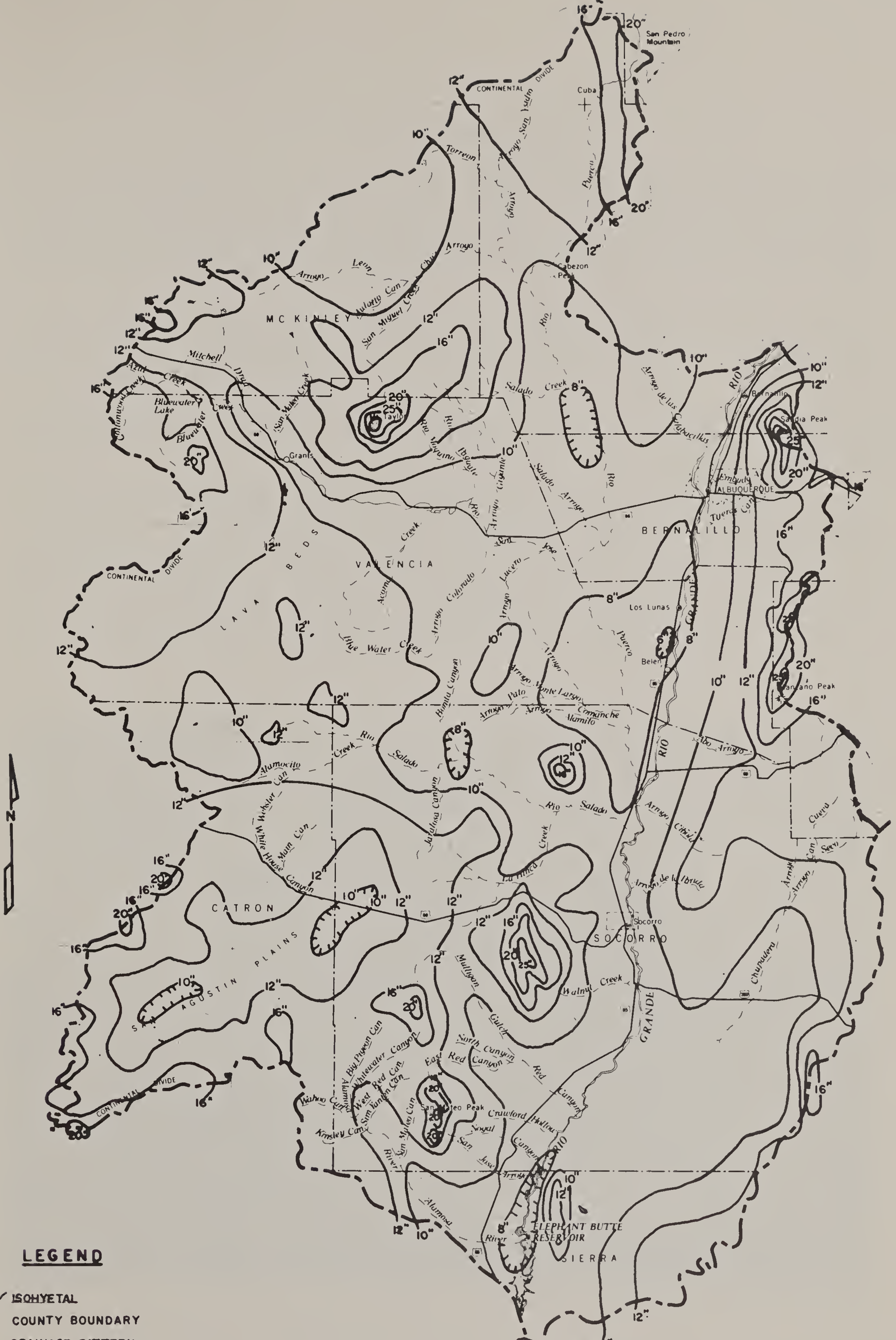
SCS PHOTO 12-P938-6

Sparse vegetative cover caused by a combination of past unwise land use and the arid climate contributes to severe erosion and sediment problems in the lower elevations of the study area. The "carrying capacities" on range lands vary from 36 to 320 acres per animal unit. The 95,000 acres of irrigated lands are a big part of the "life blood" of the subbasin and make a significant contribution to the economy. Present water supplies are fully appropriated.

Some of the main tributaries to the Rio Grande in the subbasin are: Tonque, Las Huertas, Tijeras, Abo, Hell's Canyon, Canyon Sales, Pinos, Cibola, and Calabacillas Arroyos; Rio Puerco and Rio Salado; Cupadera, Mulligan's Gulch, Nogal, and San Sosa Arroyos; and Alamosa River.

There are thousands of acres of vegetation, including phreatophytes, that might be manipulated to increase water and forage yields. Field experimental work will be necessary in order to determine the actual effect of this vegetative manipulation.

Rio Puerco (Dirty River) carries a heavy sediment load and supports dense areas of phreatophyte vegetation, primarily salt cedar. RBFP PHOTO



LEGEND

- ISOHYETAL
- COUNTY BOUNDARY
- DRAINAGE PATTERN
- SUB-BASIN BOUNDARY
- PAVED HIGHWAY
- CITY

NORMAL ANNUAL PRECIPITATION

RIO EN MEDIO SUB-BASIN
UPPER RIO GRANDE BASIN

Social Features

This area is one of the oldest continuously occupied areas in the United States containing the Sandia, Laguna, Acoma, and Isleta Pueblos and the Canoncito and Acoma (Navajo) Reservations. Some of the first Spanish settlements in New Mexico are located in the area. The area was first explored by Coronado beginning in 1540.

At the present time, there are three predominant ethnic groups in the area: (1) the native Indian, (2) descendants of Spanish settlers, and (3) people of Anglo extraction.

The population within this area is about 366,900. The percentage of the population on public welfare is above the average percentage for the state.

Public welfare programs exist to aid in training welfare recipients in some areas. Two federal programs designed to combat "hard core" unemployment are the Area Redevelopment Act (ARA) and the Manpower Development and Training Act (MDTA). Both gave the New Mexico Employment Service the responsibility of identifying occupational training needs and the selection of trainees. The choice of training sites and the actual training are functions of the State Department of Education.

Ruin of old church in Engle, New Mexico, east of Truth or Consequences

SCS PHOTO 12-P992-16

New Mexico Counties that are economically depressed and all Indian reservations and pueblos have been designated as eligible for assistance under ARA.

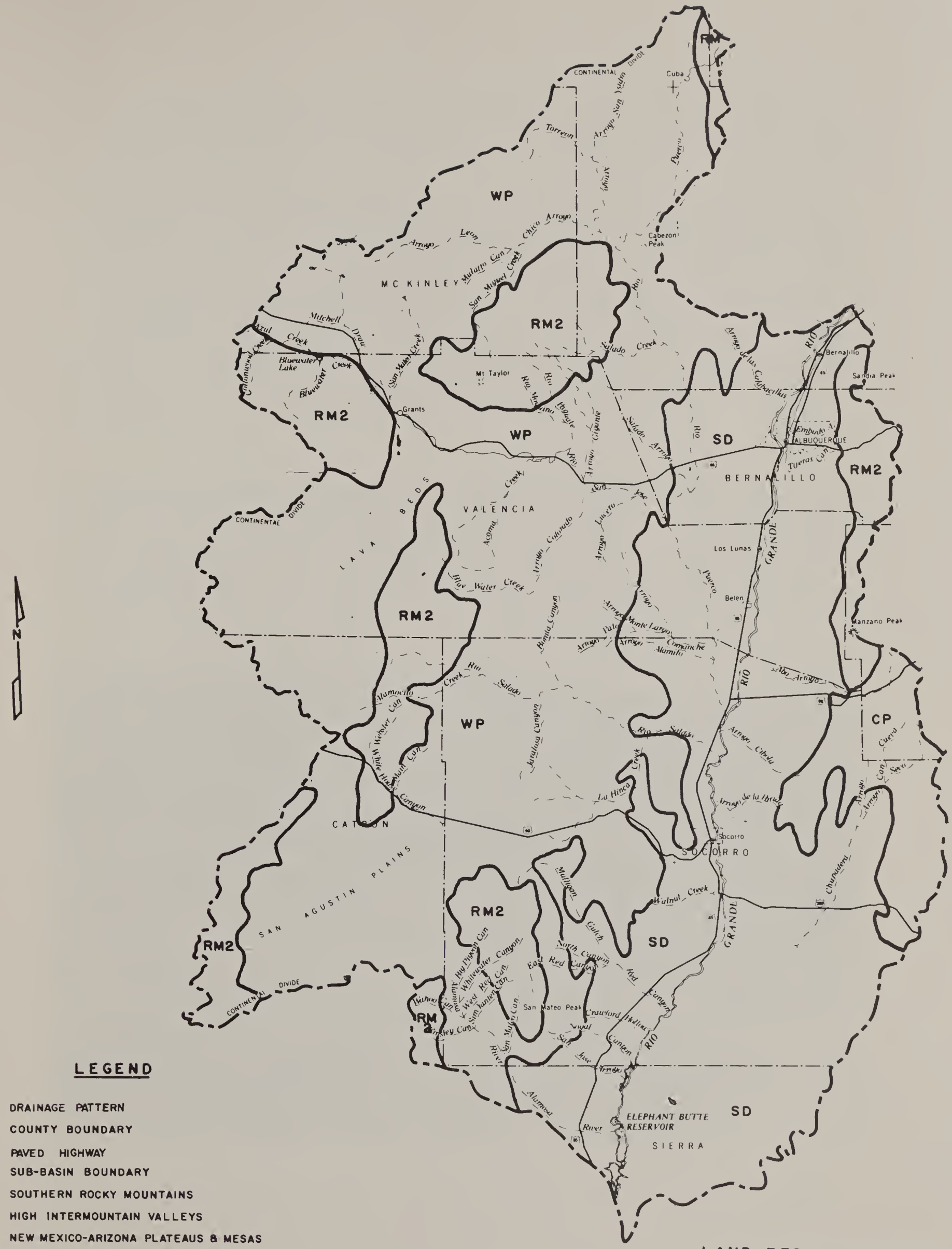
This entire subbasin is within the Four Corners Economic Development Region and includes parts of New Mexico Planning and Development Districts 1, 3, and 5.

Land Resource Areas

The individual land resource areas (LRA) are geographical areas characterized by particular patterns of soil (including slope and erosion), climate, elevation, water resources, land use, and type of agriculture. There are five land resource areas represented in this subbasin as follows:

1. New Mexico and Arizona Plateaus and Mesas (WP) - This "LRA" is located in the western part of the study area at altitudes of 5500 to 7000 feet above mean sea level. The vicinities of Grants and the San Agustin Plains are typical of this "LRA". Shrubs and short grass are the main vegetation; however, pinyon and juniper trees occupy the shallow soils and higher elevations. Most of the land is used for grazing except scattered areas of

New Mexico and Arizona Plateaus and Mesas Land Resource Area. Acoma Pueblo (Sky City) in distance SCS PHOTO 12-P992-8



LEGEND

- DRAINAGE PATTERN
- COUNTY BOUNDARY
- PAVED HIGHWAY
- SUB-BASIN BOUNDARY
- RM SOUTHERN ROCKY MOUNTAINS
- HV HIGH INTERMOUNTAIN VALLEYS
- WP NEW MEXICO-ARIZONA PLATEAUS & MESAS
- SD SOUTHERN DESERTIC BASINS PLAINS AND MOUNTAINS
- RM2 ARIZONA-NEW MEXICO MOUNTAINS
- CP PECOS-CANADIAN PLAINS AND VALLEYS
- ○ CITY

LAND RESOURCE AREAS

RIO EN MEDIO SUB-BASIN
UPPER RIO GRANDE BASIN

irrigation along the Rio San Jose and the Puerco which produce climatically adapted field crops. The area is characterized by gently sloping mesas and plateaus surrounded by precipitous cliffs.

2. Southern Rocky Mountains (RM) - This "LRA" occurs in the extreme northern tip of the study area. It is characterized by steep mountains dissected by narrow stream valleys. High plateaus and steep-walled canyons are common. Altitudes range from 6000 to 10,600 feet above mean sea level. Upper mountain slopes support forests of mixed conifer, spruce, fir, and aspen, while pinyon-juniper woodlands and sagebrush occur at lower elevations. The high elevations are utilized for summer grazing, forestry products and recreation. The lower elevations are used for range. Irrigated fields of native hay and alfalfa are scattered along bottomlands at lower elevations.

Southern Rocky Mountains Land Resource Area. Photo taken near Cuba, New Mexico

SCS PHOTO 12-P990-16

3. Southern Desertic Basin (SD)- This "LRA" comprises a large part of the study area. It is located along the Rio Grande at elevations of 4500 to 6500 feet. It is part of a large desert "LRA" that extends from the southwestern corner of New Mexico to the Big Bend Country in Texas. Desert shrubs and short grass cover much of the area, but there are open pinyon-juniper woodlands at high altitudes. Livestock production is the main use and carrying capacities are generally low. Irrigation projects occur along the Rio Grande. Alfalfa, vegetables, and orchards are the main crops.

Southern Desertic Basins Land Resource Area. Photo taken east of Elephant Butte Reservoir. SCS PHOTO 12-992-14

4. Arizona and New Mexico Mountains (RM2) - This mountainous "LRA" is similar to the Southern Rocky Mountain area except average annual temperatures are slightly higher. It is represented in the subbasin by the northern tip of the Sandias, the Ortiz, and the Cebolleta Mountains. The higher elevations (about 5 percent of the area) are in forests of spruce, fir, and ponderosa pine while the lower elevations are covered with pinyon and juniper trees, chaparral, and mixed grasses. Most of the area is rough and steep and is used for harvest of forest and woodland products, livestock production, and recreation.

Arizona and New Mexico Mountains Land Resource Area. Photo taken near Grants, New Mexico

FS PHOTO

Pecos-Canadian Plains and Valleys Land Resource Area. Photo taken near Mountainair, New Mexico

SCS PHOTO 12-P962-6

5. Pecos-Canadian Plains and Valleys (CP) - The subbasin includes a small part of this gently sloping "LRA" in the eastern part of Socorro County. Elevations range from 5,000 to 6,000 feet. Most of the slopes of this dissected high plain are gentle or rolling, but bands of steep slopes and rough broken land border the stream valleys. This "LRA" is primarily grassland with scattered woodland and is used for livestock production.

Uses Of Report

This preliminary report is intended to summarize the present and projected problems and needs and to present short-range development opportunities that local people could initiate at an early date. It informs local people of the Department of Agriculture programs of assistance available to help solve their problems. Possible uses of the report are:

1. To help soil and water conservation district boards of supervisors revise and up date their long-range programs of work and to provide them with objectives and goals for their annual plans of work.

2. To inform landowners and operators of resource problems, of courses of action for solving these problems, and of the probable results of courses of action.

3. To indicate to business and community leaders how local action programs, utilizing natural resources, can support new industry, expand business activity, and encourage growth in the economy.

4. To help county commissioners, and the State Highway Department evaluate development trends which may serve as a basis for projecting current and future highway needs.

5. To assist state and county action groups to identify rural problems and suggest ways to more completely develop the natural, human, economic, and social resources.

6. To identify for state and federal agencies, opportunities for coordination of efforts to make maximum contributions toward the conservation, development, and use of natural resources.

7. To provide regional organizations (Economic Development Districts, Four-Corners Regional Development Commission, Councils of Governments, etc.) with factual data which could be considered for program coordination and action by such organizations.

8. To provide land use planning and zoning entities with factual data to guide their planning and decision-making activities.

Participating Agencies

The study is in accordance with the Memorandum of Understanding, dated April 15, 1968, between the Administrator of the Soil Conservation Service, the Chief of the Forest Service, and the Administrator of the Economic Research Service. Representatives of these agencies constitute a field advisory committee to oversee the conduct of the survey. Specialists and technicians from these agencies and the New Mexico State Engineer Office constitute the field party which gathered and evaluated the data in this report.

Acknowledgment to Others

Many state and federal agencies, in addition to the Department of Agriculture and the State Engineer of New Mexico, have provided data and assistance for this report. Significant contributions have been received from private individuals, business firms, the state's universities, and retired professional people.

Existing Water and Related Land Resource Projects and Programs

Agencies of the Departments of Agriculture, Interior, and Army and the State of New Mexico have existing projects and programs which are designed to meet some of the needs for conservation and utilization of El Rio en Medio's water and land resources.

Soil Conservation Service

Public Law 566 offers opportunities for dealing with small watershed protection and flood prevention problems. These are discussed in the section on watershed investigation reports.

Public Law 46 - The 74th Congress enacted Public Law 46 which established a national soil and water conservation policy creating the Soil Conservation Service. It directed the Soil Conservation Service to develop a program to produce results in preventing soil and water wastage and in reducing flooding and sediment hazards. To effectively carry out this responsibility, technical services are available to land owners in organized soil and water conservation districts to assist in planning, designing, and applying conservation practices.

Public Law 1021, Great Plains Conservation Program - The purpose of this program is to expedite needed changes in land use and the application of necessary conservation treatment to land. The legislation authorizes cost sharing to facilitate such changes and is applicable in the Torrance and Socorro County portions of the El Rio en Medio area.

Public Law 87-703, Resource Conservation and Development - This authority of USDA is available to local sponsorship that is willing to combine local determination with local leadership and self government toward the objective of effecting conservation and economic opportunity through development of their area's natural resources.

Forest Service

National Forest Development and Multiple-Use Program - National Forests are managed under principles of multiple use to produce a sustained yield of products and services as authorized and directed by the Multiple Use Act of June 12, 1960. These principles provide for the management of forest resources so that they are utilized to best meet the needs of the American people. These forest resources are water, timber, range, recreation, and wildlife habitat.

Water Resources - As regulators of water flows, National Forest watersheds are managed in accord with two principal objectives: (a) protection of the watershed to preserve and improve water quality, (b) management of the watershed to increase water yield in harmony with other resources and uses.

Timber Resources - The goal for the National Forest system is annual harvest on a sustained yield basis to meet the projected need for timber which the National Forests will be expected to supply. Management objectives to meet this goal are: (a) protect, develop and utilize the timber resource so it will contribute its greatest social and economic benefits on a sustained yield basis in harmony with protection, development, and use of other National Forest system resources and activities, (b) improvement of timber stands, (c) reforestation of non-stocked or poorly stocked lands, (d) maintain proper stocking and growing conditions in young stands through timely timber stand improvement measures, and (e) reduce fire, wind, insect, and disease losses through proper harvesting, and direct control.

Range Resources - An estimated 930,000 acres of National Forest system lands are suitable for the grazing of livestock.

Objectives for managing the range resource are: (1) produce the maximum amount of forage on a sustained yield basis, consistent with other uses and demands, and (2) maintain a healthy livestock industry by (a) restoring depleted ranges to full production, (b) managing in accordance with proven methods and techniques, and (c) encouraging improvement and proper use of adjacent and intermingled rangelands.

Stable watershed

RBFP PHOTO

Misused watershed

SCS PHOTO 12-P938-7

Forest Products

RBFP PHOTO

Processing Mill

RBFP PHOTO

Abuse (right) versus proper use of the range resource RBFP PHOTO

Good stock watering facilities make for better use of range RBFP PHOTO

Brush control with ecological, aesthetic, and wildlife consideration

RBFP PHOTO

Cholla cactus - an undesirable range plant

FS PHOTO

Recreation Resources - The recreational potential of the National Forest land is relatively unlimited. Presently, with few exceptions, the entire National Forest area is open to hunting, fishing, riding, and hiking.

Projected population growth will add to the present intense use of National Forest recreational facilities. It is the policy of the Forest Service to provide facilities for visitors to the National Forests. Intensive recreation management composite plans select areas of high recreation value so they can be managed and developed to balance the needs of the people with the capacity of the land. These sites will be developed dependent on demands and availability of funds. If recreation demands develop beyond those projected, site selection criteria might be altered to make additional area available.

Wildlife Resources - The long-range objectives of wildlife management are to provide and maintain an environment conducive to the fullest production of fish and wildlife in harmony with the uses and management of other resources. Vegetative-type conversion may change the environment. Such projects will be designed and executed giving full recognition to wildlife needs. Extensive-type conversion project financing will include provisions for inventories prior to beginning of operations. Areas found important to wildlife will be given special consideration for protection and enhancement. Forest Service policy and guidelines will govern allowances for wildlife cover, forage, and protection on all type conversion projects on National Forest lands.

Fire Control - Control of wildfire is basic to the protection of all vegetative and wildlife resources. Fire protection planning must anticipate greater risks as the forests annually accommodate more users.

Fire damage is frequently followed by disastrous insect and disease invasion on forested areas. It usually results in erosion, increased sediment and floodwater production, sediment deposition, and destruction of forage required by both livestock and wildlife. Serious economic losses are incurred by forest industries, forest dependent communities and range operators.

Prevention and prompt suppression of potentially disastrous range or forest fires are now, and will continue to be, important facets of resource and watershed management. Prescribed burning is coming to be recognized as a management tool in certain cover types and will be used more extensively as methods and procedures are better understood. However its use depends upon the user's ability to use without harming the air quality.

Other Department of Agriculture Programs

Agricultural Conservation Program administered by the Agricultural Stabilization Service is the program through which the United States Department of Agriculture provides a cost share for landowners and operators to install conservation practices that are difficult and expensive, but which have enduring benefits to the economy, promote proper land use, and effect efficiencies and resource savings.

Farmers Home Administration is a lending agency of the United States Department of Agriculture and provides credit and management aid to people in rural areas. Loan programs available to those who are unable to obtain loans from private sources are: (1) farm ownership loans, (2) farm operating loans, (3) housing loans, (4) under Title III, Economic Opportunity Act of 1964, FHA provides assistance loans up to $2,500 for establishing profit-making enterprises, (5) soil and water development loans. (Under this program, groups of farmers or urban dwellers may form an association and obtain loans for development of water and sewer facilities). (6) Recreation development loans, (7) loans to grazing associations, (8) loans to local organizations to finance the local share of costs of carrying out Public Law 566 works of improvement.

Cooperative State-Federal Forestry Programs - The U. S. Forest Service and the New Mexico State Forestry Department are involved in three state-federal cooperative forestry programs: (1) fire control, (2) forest management, and (3) tree planting. The New Mexico State Forestry Department is providing fire protection on state and private lands in the state. The U. S. Forest Service provides fire protection for state and private lands inside and immediately adjacent to National Forest boundaries under contractual arrangements with the State Forestry Department.

Reservoir or Other Local Protection Projects

Corps of Engineer Projects

The Rio Grande Floodway was authorized by the Flood Control Acts of 1948 and 1950 as a part of the comprehensive plan of development and a joint undertaking by the Corps of Engineers and the Bureau of Reclamation to provide flood protection and major drainage works along the Rio Grande in New Mexico. The plan consists of a system of levees operating in conjunction with river channel rectification work and rehabilitation of drainage systems to provide flood protection to developments along the Rio Grande. The middle valley floodway extends from Cochiti to San Marcel, a distance of about 130 miles, and consists of the Cochiti to Rio Puerco reach (which includes the completed Albuquerque unit) and the Bosque del Apache reach.

The Albuquerque Diversion Channels Project was authorized by the flood control act of 1954. This project is designed to provide protection to the city of Albuquerque from floods originating along the west slopes of the Sandia Mountains and the mesa east of the Rio Grande. The project consists of two diversion channels and appurtenant works located on high ground east of and generally parallel to the valley. The North Channel (completed in 1968) drains northward and intercepts flood flows from numerous waterways between Interstate 40 and Alameda, a

distance of about 10 miles. The South Channel (under construction) will direct flood flows south of Highway 66 to the Rio Grande through an outfall channel at Tijeras Canyon. This channel is about 6.3 miles long.

Bureau of Reclamation Projects

Elephant Butte Dam is the southern boundary of the study area. The dam was constructed in 1916 by the U. S. Bureau of Reclamation. The stored water is used for power development and irrigation in New Mexico and Texas. The Bureau of Reclamation currently operates and maintains the works of the rehabilitated Middle Rio Grande Conservancy District.

Projects of Conservancy, Irrigation, or other Districts

The Middle Rio Grande Conservancy District was organized in 1925 to rehabilitate and operate an irrigation water delivery and drainage system in the middle Rio Grande Valley. The district is operating one storage reservoir, four diversion dams, five drainage wells, 780 miles of canals and laterals, 393 miles of open drains, 250 miles of maintained levees and 186 miles of river channel.

Irrigated alfalfa near Socorro, New Mexico SCS PHOTO 12-P991-14

Irrigation water for the district is diverted from the river at four main points. In the district there are 121,680 acres of water right land of which about 40,000 acres are classed as "6W" (unsuitable for sustained irrigation). The El Vado Dam and Reservoir located on the Rio Chama about 17 miles west of Tierra Amarilla with a capacity of 194,500 acre-feet regulates the headwaters of the river for delivery and use in the district.

Principal crops grown in the district are in order of importance: alfalfa, cereal crops, fruit, and vegetables. Practically the entire crop production of the district is used locally.

Bluewater-Toltec Irrigation District - Application was made in November 1923 to appropriate water from Bluewater Creek for irrigation. Stream-flows would be regulated in the proposed Bluewater Reservoir which would have 92,100 acre-feet of storage. Subsequently, in 1927, the application was amended reducing the storage capacity of the reservoir to 52,000 acre-feet. Proof of completion of the work was filed with the State Engineer Office in August 1927. In June 1948, the State Game and Fish Commission of New Mexico contracted with the District for a minimum pool of 3,500 acre-feet in the reservoir for fish culture and recreation. The district

Dam creates Bluewater Lake west of Grants, New Mexico. This is one of the subbasin's popular recreation areas. RBFP PHOTO

has water rights of about 16,500 acre-feet per year to irrigate about 5,500 acres of land in the Bluewater-Milan-Grants area. At present, a portion of the rights are being utilized by the uranium industry in the district.

Other Reservoir Projects - There are several small regulating reservoirs for irrigation serving private and Indian lands. One example is the San Mateo Dam and Reservoir located on San Mateo Creek about one mile east of the Village of San Mateo in North Central Valencia County. The dam was constructed in 1934 as a Federal Emergency Relief Administration project with a reservoir capacity of about 50 acre-feet. In 1954 needed repairs and an enlarged emergency spillway were completed by the state and the local water users.

Other Programs and Organizations

Bureau of Land Management (BLM)- Erosion control structures and stock tanks have been planned by the Bureau of Land Management for construction over a ten-year period. Since 1962, about one-half of these planned units have been completed. Thousands of acres of pinyon-juniper have been cleared and seeded to grass. Also several thousand acres of big sagebrush have been plowed and seeded to grass. An active program of proper range management is being carried out on lands administered by BLM.

Bureau of Indian Affairs (BIA) - A program to construct debris basins and erosion control structures exists under which the Bureau of Indian Affairs provides funds up to $2,500 per Indian land allotment for construction funds to match the USDA, Agricultural Conservation Program. A program of clearing pinyon-juniper lands and seeding to grass is also being carried out on lands where this practice is applicable.

Bureau of Sports Fisheries and Wildlife - Bosque del Apache National Wildlife Refuge, located along the Rio Grande 20 miles south of Socorro, was established in 1939 for the protection of the greater sandhill crane and wintering geese flocks. The endangered Mexican duck is native to the area and rests on the refuge. It covers more than 57,000 acres, 13,000 acres of which is bottomland.

The refuge bird list records 270 species of birds. Muskrat, beaver, mule deer, coyotes, and bobcat are also frequently observed.

Legumes and domestic grasses are established on 600 acres and grain crops occupy 1,250 acres.

Canadian geese on Bosque del Apache Wildlife Refuge SCS PHOTO 12-P991-3

Soil and Water Conservation Districts are groups of landowners organized under state law to identify and combat problems involving soil and water. These districts, using the programs of the Soil Conservation Service and other federal and state agencies, are an effective force to fight water and soil waste. Districts in the El Rio en Medio area include: Salado, Sandoval, Sierra, Central Rio Grande, Cuba, Socorro, East Valencia, McKinley, Lava, and Jemez.

Community Ditch Systems are recognized political subdivisions of the state. All of the irrigation systems except the Middle Rio Grande Conservancy District, systems on Indian lands, and the Bluewater-Toltec Irrigation District are operated by community ditch systems or "acequias".

State Developments for Recreation, Fish and Wildlife - The State Department of Game and Fish owns about 21,635 acres of land within the subbasin. These lands, in seven different tracts ranging in size from 110 to 14,500 acres, are utilized for big game, waterfowl, and upland birds management and for fishing. In addition, the department leases some 1,300 acres of land and water for fishing and waterfowl management. State trust lands are also leased by the Department for big game hunting.

Blue or scaled quail - popular upland New Mexico game bird.

N.M. DEPT. OF GAME & FISH

There are two state parks, Bluewater Lake and Elephant Butte Lake, encompassing leases of 42,160 acres of land and 19,350 acres of water. These areas are developed for water-based recreation. Major municipalities also operate and maintain parks, swimming pools, and other public recreation facilities.

The Four Corners Economic Development Region - A Four Corners Economic Development Commission was established in 1966 under Title V of the Public Works and Economic Development Act of 1965. All counties of the subbasin are within the New Mexico portion of this region.

Councils of Governments - The portions of Bernalillo, Sandoval, Valencia, and Torrance Counties within the El Rio en Medio Subbasin are in State Planning and Development District No. 3. This Council of Governments, operating under Federal Authority of Bureau of the Budget Circular A-95, the State Regional Planning Act, and local articles of agreement, provides sponsors of projects or practices unified, comprehensive and balanced cooperation among local governments. Through Councils of Governments, local prerogative and local autonomy is maintained in areas which have traditionally been under local jurisdiction. Local identity assumes real meaning as it becomes an integral part of the metropolitan area plan.

Population and Employment Trends

Population and employment show healthy gains over past decades and growth rates exceed those in the state as a whole. This is because Albuquerque, the largest city in the state (250,000 population) is located in the subbasin. The growth rate expected is as indicated in tables 2 and 3.

During 1930, 17 percent of the state population lived in the subbasin. This proportion grew to 33 percent in 1960 and is expected to be about 37 percent in 1980. This typifies to some extent the national "rural to urban" migration trend and the rapid growth of large southwestern United States cities. Population projections are based on data developed by the Bureau of Business Research (BBR), University of New Mexico, and the U. S. Office Business Economics--Economic Research Service (OBERS).

Two projections of subbasin population are shown in tables 2 and 3. The OBERS projections are based on a continuation of New Mexico's shares of national population. The BBR projections are based on the expected employment opportunities in New Mexico.

Employment in agriculture has decreased substantially and is projected to continue decreasing. This loss is compensated for by large increases in construction, manufacturing and services, especially in Bernalillo County.

Table 2, Population, El Rio en Medio Subbasin, 1930-1980

Year	Population in 1,000's			Percent increase			Percent state increase
	Trend	Projections OBERS	Projections BBR	Trend	OBERS	BBR	
1930	71.2						
1940	101.0			42			25
1950	177.8			76			28
1960	311.5			75			39
1970		385.2	424.9		24	36	27 1/
1980		481.8	601.7		25	42	35 1/

1/ Based on BBR projections.

Table 3, Employment, El Rio en Medio Subbasin, 1940-1980

Year		Projections OBERS	Projections BBR	Percent increase Trend	Percent increase OBERS	Percent increase BBR	Percent state Increase
	Trend						
1940	26.8						
1950	60.3			125			56
1960	108.1			79			42
1970		129.1	155.3		20	43	37 1/
1980		171.6	216.8		33	39	34 1/

1/ Based on BBR projections

Water Rights Administration [1/]

New Mexico law provides that the surface and underground waters of the state belong to the public and are subject to appropriation for beneficial use. Such use is the basis, the measure, and the limit to the right to use of water and priority in time gives the better right. The underlying principle is known as the appropriative doctrine of water rights. Where it applies, the mere physical presence of water upon, within, or adjacent to land does not confer upon the owner of the land, ownership of the water or a right to its use.

Water rights in New Mexico are administered by the State Engineer in accordance with provisions of the constitution and the statutes, the adjudication of the courts, the terms of interstate water compacts, and the rules and regulations of the State Engineer. Seven interstate compacts to which the state is signatory affect development and use of water in New Mexico. Situations in which there is intimate relationship between occurrence of groundwater and the flow of surface streams require coordinated administration of diversions by wells and by surface works in order to insure that valid water rights are served and that the state's ability to meet interstate water-delivery obligations is preserved.

Much of the El Rio en Medio area is within the boundaries of three declared underground water basins. They are Rio Grande, Sandia, and Bluewater. Waters of the subbasin are fully appropriated, consequently no new depletions of the available surface water supply is allowed. Permit to change the place and the purpose of existing water uses may be obtained providing the changes can be made without impairment of existing rights. To this extent, new water uses served by the existing supply are allowed. New uses may also be allowed if their effect on flows of the Rio Grande can be offset by imported water. Groundwater may be appropriated for new uses if the effects of such taking on the surface flow of streams are, at all times, offset by retirement of valid surface water uses.

The Rio Grande Compact, between the states of Colorado, New Mexico, and Texas, apportions waters of the Rio Grande stream system among these states and defines the obligations of the upstream states to deliver water by schedules that establish the outflow which must be maintained with a given inflow. New Mexico's obligation to deliver water to Elephant Butte Dam is established by the flow of the Rio Grande at the Otowi gage. The compact requires that appropriate adjustments be made to streamflows to reflect new or increased depletions in the applications of the schedules.

1/This statement was prepared by the Office of the New Mexico State Engineer

It defines and limits storage rights and protects the priority of the storage rights of Elephant Butte Reservoir over later upstream storages. The compact provides that the state, having the right to the use of any water imported to the Rio Grande Basin, shall be given proper credit therefor in the application of the schedules for delivery of water. Works to import water to the Upper Rio Chama are now being constructed.

SCS PHOTO 12-P992-10

Elephant Butte Dam - storage reservoir for lower Rio Grande irrigation

II. WATERSHED INVESTIGATION

REPORT SUMMARIES

This section contains summaries of pertinent information from (1) ten watershed investigation reports, (2) the Corrales Watershed work plan which has been authorized for operations, and (3) the Sandias and (4) Belen-Los Lunas Watersheds which have been authorized for planning. The complete watershed investigation reports are contained in the appendix to this report along with data from the Corrales, Sandias, and Belen-Los Lunas Watersheds. These watersheds were selected for investigation because they have Public Law 566 potential for solving water and related land resource problems. The proposed projects appear to be physically and economically feasible, and should be initiated within the early action period. One of the projects is currently being planned.

A major problem in all of these watersheds is floodwater and sediment damage. The primary benefits would stem from reduction of flood damage. In addition to flood protection, these projects will reduce sediment damage downstream, reduce water pollution, improve the general environment, and may serve other justifiable purposes such as recreation and municipal and industrial water storage. The inclusion of water-using purposes must comply with laws governing the appropriation and use of the public waters of the state.

Benefits accruing to the general public include flood damage reduction to roads, bridges, streets, culverts, public utilities, and public recreation areas.

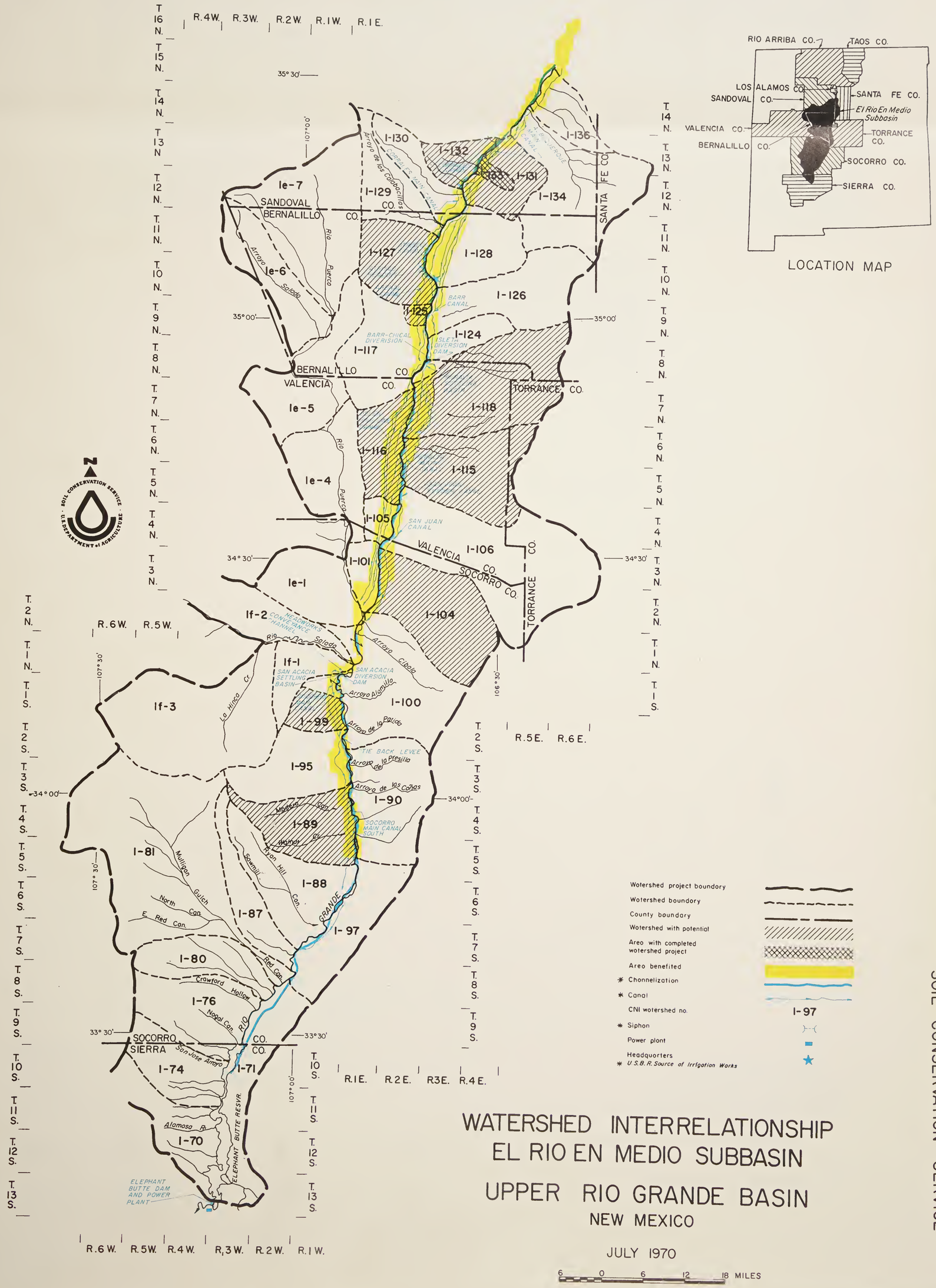
The proposed treatment on each watershed includes needed land treatment and structural measures.

The potential flood protection projects within this subbasin and the El Rio Arriba Subbasin are all interrelated. All of the potential land treatment and structural measures are located on arroyos which are tributary to the Rio Grande.

Throughout the length of the Rio Grande there are many irrigation diversion dams. Any potential project which would decrease the amount of sediment delivered to the main stem of the Rio Grande would be of some benefit to each and every one of the diversion dams and the land on which the water is used.

The many diversion dams on the main stem of the river lead to many miles of irrigation canals for conveyance of irrigation water to the location of its use. Due to the topography and slope adjacent to the river channel, the conveyance systems intermingle, overlap, and cross one another all the way from the Cochiti Dam to the Elephant Butte Reservoir. The systems of intermingled canals convey water to irrigated lands which form an interrelationship of watersheds tributary to the Rio Grande.

Belen-Los Lunas Watershed Flood Results, June 1969 RBFP PHOTOS



WATERSHED INTERRELATIONSHIP
EL RIO EN MEDIO SUBBASIN
UPPER RIO GRANDE BASIN
NEW MEXICO

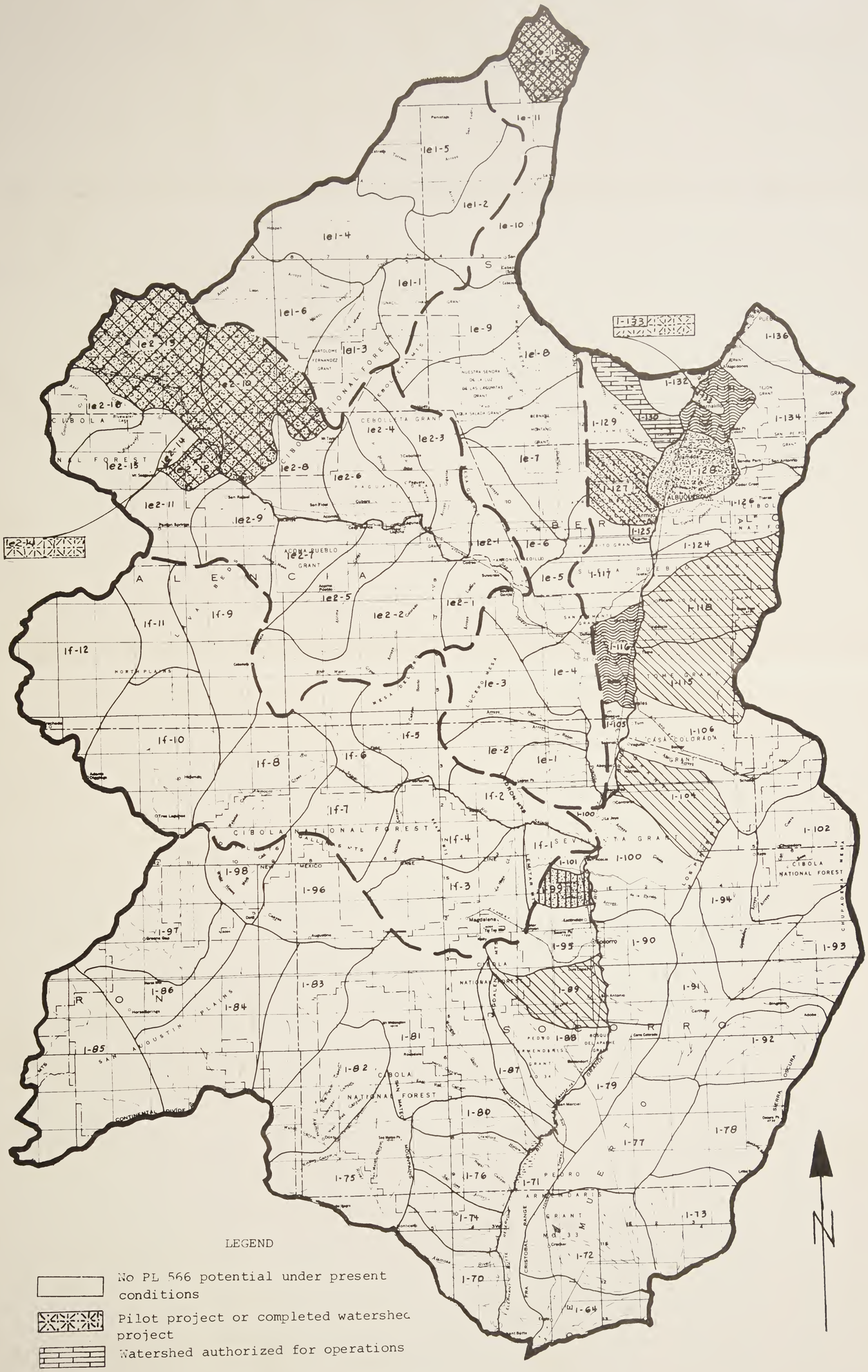
JULY 1970

6 0 6 12 18 MILES

SCALE 1:850,000

SOIL CONSERVATION SERVICE

M7-R-21742-N



LEGEND

- No PL 566 potential under present conditions
- Pilot project or completed watershed project
- Watershed authorized for operations
- Watershed with preliminary investigation, field examination, or river basin watershed investigation completed and having PL 566 potential
- Watershed authorized for planning
- Watershed work plan discontinued
- Watershed application
- Watershed with PL 566 potential (according to CNI data)
- Watershed with application but not feasible at present time

WATERSHED MAP
RIO EN MEDIO SUB-BASIN
UPPER RIO GRANDE BASIN
NEW MEXICO
JULY, 1970

10 0 10 20 Miles

Pajarito Arroyos Watershed
CNI #1-125

The watershed is located on the west side of the Rio Grande and includes portions of the city of Albuquerque. Numerous arroyos drain the slopes of the west mesa toward the Rio Grande. None of the arroyos have natural outlet channels to the river; therefore, they empty into the main irrigation canal filling it with floodwater, sediment, and debris causing flooding of the area below the canal.

There are about 7,300 acres subject to flood damage. This area is currently used for residential, small business, and interspersed farming. It is projected that within 25 years the damage area will be fully developed for residential use and will have a population of about 25,000.

The first increment for a watershed project should be land treatment programs consisting of measures that will encourage better vegetative cover conditions and result in reducing erosion and runoff from the rangeland. The cropland should be treated with measures that will improve irrigation water management and enhance productivity of the land. To supplement land treatment measures, five floodwater retarding structures with associated floodwater diversions and outlet channels are needed to obtain flood protection for the damage area. These structural measures would control about 89 percent of the drainage area and reduce present damages by approximately 92 percent. With a fully developed urban area and without flood control measures, the average annual damage is estimated to be $371,000. These damages could be reduced to about $30,000 annually with the installation of project measures resulting in a reduction of damages of $341,000. Redevelopment and secondary benefits associated with the installation, operation, and maintenance of project measures would be about $78,300 on an annual basis. Total project benefits are estimated to be $419,300, and when compared to the average annual cost of $266,500 for structural measures, a benefit-cost ratio of 1.6 to 1 is derived.

Hell's Canyon Watershed
CNI # 1-118

This watershed includes 183,872 acres of land located about 10 miles south of Albuquerque and takes in parts of Bernalillo and Valencia Counties, New Mexico. The relief pattern is to the west draining the west slopes of the Manzano Mountains. Arroyos in the watershed originally had channels which outletted into the Rio Grande. As the bottomland was developed, the arroyos were leveled. They now terminate and empty into the main irrigation canal. Channels to convey flood flows to the river are non-existent. Floodwater and sediment cause damages to roads, residences, irrigation facilities, farm equipment, and irrigated cropland. About 700 acres of crops and cropland are damaged every year from floods. Damages from

interrupted irrigation services occur on an additional 4,000 acres of land.

There is a need for improved land treatment and other flood prevention measures to control the floodwater and sediment discharged from the arroyos. Land treatment practices should consist of measures which will increase the vegetative cover, decrease erosion from all sources, retard runoff and improve agricultural water management. In order to obtain the level of protection needed, five floodwater retarding structures and outlet channels will need to be installed.

The agricultural area subject to flooding by the one-percent chance storm event is estimated to be 9,400 acres. There are approximately 400 farm homes, small businesses, and rural non-farm residences subject to flooding. Agricultural damages to crops and pastures amount to about $139,400 annually. Other agricultural damages requiring repairs to irrigation canals, farm roads and bridges, and releveling of cropland are estimated to be $24,200 annually. Average annual damages to urban developments are estimated to be $146,000. Indirect damages associated with flooding are estimated to be $31,000 annually. The sum of all of these damages amounts to $340,600 per year. After the project measures are installed, these damages will be reduced to about $17,000 annually, a reduction of 95 percent.

This will result in a damage reduction benefit of $323,600 annually. Redevelopment and secondary benefits associated with the installation and maintenance of project measures are estimated to be $96,450 annually. The sum of all project benefits evaluated amounts to $420,000, and the average annual cost of structural measures including operation and maintenance amounts to $325,700. A comparison of benefits and costs indicates that a benefit-cost ratio of 1.3 to 1 may be achieved.

Canyon Sales Watershed
CNI #1-115

The location of this watershed is in the east central part of Valencia County, New Mexico and about 25 to 30 miles south of Albuquerque. The watershed includes an area of about 147,100 acres. The drainage pattern is generally to the west. The arroyos originally had outlets to the Rio Grande, but in recent years the bottomland along the Rio Grande has developed into intensively used irrigated cropland. In the development of this land, the arroyos were leveled and are now being farmed. These arroyos have no channels into the river but drain into the main irrigation canal. They overflow the canal and flood the irrigated farmland below.

About every three years approximately 1,000 acres of land are damaged to the extent that crops are lost and the land must be re-leveled. In addition to the flood damage area, there are about 1,000 acres of irrigated cropland which suffers damage because canals are filled with sediment and water cannot be delivered to the fields. Several homes in the watershed receive flood damage almost every year. Highways, bridges, and farm roads are damaged annually.

Land treatment systems outlined in the watershed investigation report will encourage better cover and result in reduced erosion and runoff from the rangeland. To achieve the desired level of flood protection, land treatment practices will be supplemented by three floodwater retarding structures and related channel improvements. The average annual cost of installing these measures, including operation and maintenance is about $87,450. Without the flood protection, agricultural damages are estimated to be $46,000 and urban damages 54,800 annually. Indirect damage associated with the flood hazard is expected to be about $10,000 annually. After the installation of project measures these damages are expected to be reduced by about 90 percent. This reduction would yield about $99,700 in average annual benefits. In addition to these benefits, redevelopment and secondary benefits are estimated to be $27,000 annually. Total project benefits are estimated to be $126,700 annually. A benefit-cost ratio of 1.4 to 1 is derived by comparing total project benefits to the average annual cost of structural measures.

Pino Draw Watershed
CNI #1-104

The watershed is located in the northeastern part of Socorro County, about 27 miles north of Socorro. The arroyos in this watershed have no outlets to the river and empty into and overflow the canals and flood the irrigated farmland below. Flood damages are reported every year by the local people. On the average of once every three years about 1,000 acres of land are damaged to the extent that crops are lost and the irrigated land has to be releveled.

Floodwaters heavy laden with sediment flow into the canals filling them with sediment causing extensive damage due to curtailed delivery of irrigation water on about 5,600 acres of cropland. This includes some irrigated land outside of the watershed. Several homes are damaged in the communities of Las Nutrias and Veguita by floodwater almost every year. Highways and bridges are damaged annually. Three or four miles of State Highway 47 must be cleared of sediment each time the arroyos flood.

The watershed needs a land treatment program and flood prevention measures designed to reduce the floodwater and sediment damage to residences, businesses, highways, canals, and cropland. The land treatment program should consist of measures that will encourage better vegetative cover conditions and result in reducing runoff and erosion on the rangeland.

To provide the level of flood protection that is desirable for the area being damaged, five floodwater retarding structures with related outlet channels are recommended.

Average annual flood damages evaluated under present conditions amount to $170,800. After project measures are installed, the average annual damages will be reduced to $10,600. This is approximately 94 percent reduction in damages. Redevelopment and secondary type benefits accruing to local labor and associated business activities amount to about $44,100

annually. Average annual project benefits evaluated amount to about $204,300 and the average annual cost for structural measures is estimated to be $137,200. When average annual benefits are compared to average annual costs, a benefit-cost ratio of 1.5 to 1 is derived.

Lemitar-Polvadera Arroyos Watershed
CNI #1-99

This watershed is about 4 miles north of Socorro on the west side of the Rio Grande and contains about 32,200 acres. About 3,000 acres of agricultural and urban land are subject to flooding. There are about 70 to 80 homes and small businesses located in this area and the area subject to flood damage contains 25 farms and a population of about 150 people. Cotton, alfalfa, small grains and corn are produced. There is also some vegetable production and garden tracts. The irrigated farmlands of the watershed are damaged nearly every year by flood flows from one or more of the arroyos. All of the arroyos terminate against the Lemitar-Polvadera canals. Sediment damage to the canal causes high maintenance cost.

Land treatment practices on cropland should include land leveling, ditch lining, and a proper combination of cropping conservation systems such as pasture and hayland management, timely tillage, and irrigation management. In addition to proper grazing use, the range land area should have limited livestock use, small gully control, water-spreading devices, surface roughening, critical area seeding, and brush control. These measures will encourage better vegetative cover conditions that will, in turn, reduce runoff and erosion.

A plan for flood control consists of four potential floodwater retarding structures with associated channel improvements.

The estimated average annual sediment and floodwater damage to crops and pasture, other agricultural facilities, and roads and bridges amounts to about $50,100. Average annual urban damages are estimated to be $44,800. Agricultural and urban damages, including indirect, combined, make a total of $103,200. After project measures are installed, these damages will be reduced to $17,700, or a damage reduction of about 81 percent, or average annual damage reduction benefits of $85,500. The value of local secondary benefits accruing to the project amount to $14,500 annually. Redevelopment benefits associated with watershed project measures are estimated to be $21,300 annually. Average annual benefits are estimated to be $121,300, and average annual costs estimated to be $102,300. The benefit-cost ratio is 1.2 to 1.

Walnut Creek Watershed

CNI #1-89

The location of this watershed is in the central part of Socorro County just south of the city of Socorro and includes about 78,500 acres. Floodwater and sediment cause damages to roads, bridges, residences, irrigation facilities, farm equipment and irrigated cropland. Floodwaters from the arroyos outlet directly into the main irrigation canal. Canals fill with sediment, inundating the irrigated cropland below the canal. About 700 acres of crops and cropland are damaged every year from floods. Damages from interrupted irrigation service occur on an additional 2900 acres of land. County roads are damaged annually from flood flows. At every arroyo crossing, the roads are washed out or covered with sediment. Homes and businesses are frequently damaged in the communities of Luis Lopez and San Antonio.

Land treatment needs consist of measures which will increase the vegetative cover, decrease erosion and sediment production from all sources, and retard runoff. Land treatment on the irrigated cropland is needed to improve water management and lower water tables in some locations. Twelve floodwater retarding structures are needed to supplement the land treatment program to provide the degree of protection needed. There are no existing channels to the river and outlet channels to the river will have to be installed to control the principal spillway discharge.

Damaging floods occur in most parts of the watershed on an average of once every year. The agricultural area flooded by the 100-year frequency storm is estimated to be 3,660 acres. This area is used mainly for the production of alfalfa, corn, irrigated pasture, and a small acreage of vegetables. Agricultural damages under present conditions are estimated to total about $187,200 annually. The installation of structural measures would reduce these damages to approximately $8,000 per year. This is a 95 percent reduction in damages and produces damage reduction benefits in the amount of $179,200 per year. Flood damages to farm and ranch homes and urban development amount to about $28,300 per year. These damages would be practically eliminated after the project is installed. Indirect damages associated with flood conditions amount to $21,500 per year. The installation of the project would result in a 96 percent reduction in these damages and would produce about $20,760 in average annual benefits. The average annual cost of all structural measures, including operation and maintenance, is estimated to be $217,800, and total average annual benefits are expected to be $295,800. A benefit-cost ratio of 1.4 to 1 is derived by comparing annual benefits with annual costs.

Nacimiento-Rito Leche Creek Watershed
CNI #1e-12

This watershed is located in Sandoval and Rio Arriba Counties, in the vicinity of Cuba, 80 miles northwest of Albuquerque. The watershed has a drainage area of about 18 square miles. Floodwater and sediment damages are caused by overbank flooding of Nacimiento and Rito Leche Creeks. Both channels are so small that they overflow on an average of every two years. Both creeks have a small perennial flow and the local people are interested in water storage for recreational development. Residential and business districts of Cuba are the major areas of damage. The population of Cuba is about 1,000. There are about 350 acres of irrigated cropland in the damage area. This cropland is owned by about 50 operators and is devoted mostly to the production of alfalfa, small grains, grassland, and gardens.

More intensive application of land treatment measures and better control of grazing are needed. To supplement land treatment measures, two floodwater retarding structures and two floodwater diversions are recommended to achieve the desired level of flood protection. It is estimated that the agricultural area flooded by the 100-year frequency storm is about 150 acres. Agricultural flood damages are estimated to be $1,695 annually and will be reduced by about 90 percent with the installation of project measures. The reduction will provide benefits in the amount of $1,525 per year. The most significant flood hazard is the potential for damages in the urban area of Cuba. After increased urban development and housing development, the future urban damage is estimated to be $54,805. With the installation of structural measures for flood prevention, this damage could be completely controlled resulting in $54,805 in annual benefits. The average annual indirect damages associated with flooding would be about $5,650. These damages could be reduced to about $50 annually, yielding additional benefits of $5,600. The sum of the above damage reduction benefits is $61,930. Other project benefits from redevelopment and secondary sources amount to $17,100, and when added to damage reduction benefits of $61,930 provide a total of $79,100. When these benefits are compared to the annual equivalent cost of $55,900 for structural measures, a benefit-cost ratio of 1.4 to 1 is derived.

Pole-Zuni Watershed
CNI #1e2-12

This watershed is a tributary to the Rio San Jose which passes through Milan and Grants. The drainage area is about 67,000 acres in size. Much of the residence and business development in Grants and Milan is in the flood plain. The watershed contains about 2,900 acres of previously irrigated cropland now idle because of flood damage and a shortage of irrigation water.

The needs for flood protection in the watershed may be met partially by a land treatment program emphasizing good range management, agricultural water management supplemented by three floodwater retarding structures and related diversions. Structural measures in the two adjoining watersheds of Rio San Jose and San Mateo-Grants will benefit this watershed.

The proposed structural sites are not particularly suited for recreation pools because they lack a constant source of water and the evaporation rates are high. The estimated average annual floodwater damage to crops, hay, and other agricultural and public utilities amounts to $7,800. Urban damages in the watershed amount to about $26,100 per year. Agricultural and urban damages combined make a total of $33,900. After project measures are installed, these damages will be reduced to $4,500 or a damage reduction of about 87 percent. The estimated value of local secondary and redevelopment benefits amount to approximately $7,660 annually. Total project benefits are estimated to be about $37,000 annually, and, when compared to the average annual cost of $23,900 for structural measures, a benefit-cost ratio of 1.6 to 1 is derived.

Rio San Jose Watershed

CNI #1e2-13

This watershed is located generally north of the village of Bluewater in the northern edge of Valencia County and the south central part of McKinley County. It includes a drainage area of about 224,600 acres. There are about 1,500 acres of irrigated farmland in the watershed much of which is subject to floodwater and sediment damage. The Atchison, Topeka, and Santa Fe Railroad passes through the watershed, part of which is in the flood hazard area. The Rio San Jose drainage contributes floodwater to the urban areas of Grants and Milan. Some damage is also sustained by installations of the uranium refining plants located in the area.

The land treatment program should consist of measures designed to increase vegetative cover and decrease erosion and runoff on the rangelands and improve agricultural water management on the cropland.

Structural measures recommended for flood protection consist of two structures with related channel improvements. With the two retarding structures in place,about 92 percent of the drainage area will be controlled.

Agricultural and urban damages evaluated in the watershed investigation report make a total of $141,800 annually. After project measures are installed, these damages would be reduced by about 89 percent producing benefits in the amount of $122,700. The value of local secondary and redevelopment benefits combined make a total of $30,100 annually. The average annual cost of structural measures is calculated to be $81,350, and average annual benefits $152,800. The benefit-cost ratio is 1.9 to 1.

San Mateo-Grants Canyon Watershed

CNI #1e2-10

This watershed is located in McKinley and Valencia Counties of northwestern New Mexico and contains about 213,700 acres. The town of Grants is in the southern tip of the watershed. Important developments are the Homestake Uranium Plant, the Atchison, Topeka, and Santa Fe Railroad, the city of Grants and part of the village of Milan. The watershed is within the Four-Corners Economic Development Area of New Mexico.

The San Mateo-Grants Canyon, San Jose, and Pole-Zuni Creeks watersheds form a combination of watersheds which contribute flood flows to a common floodplain. These three watersheds should be planned simultaneously to effectively utilize watershed planning resources and arrive at the most economic combinations of structural measures. The three watersheds individually and combined have resulted in flooding and sediment deposition in Grants, Milan, and on irrigated cropland. There are approximately 200 homes and other major fixed improvements subject to flooding. In August and September 1967, heavy rains in the area caused extensive damage in Grants to streets, bridges, homes and businesses. On four occasions the sewage disposal plant was completely inundated by water.

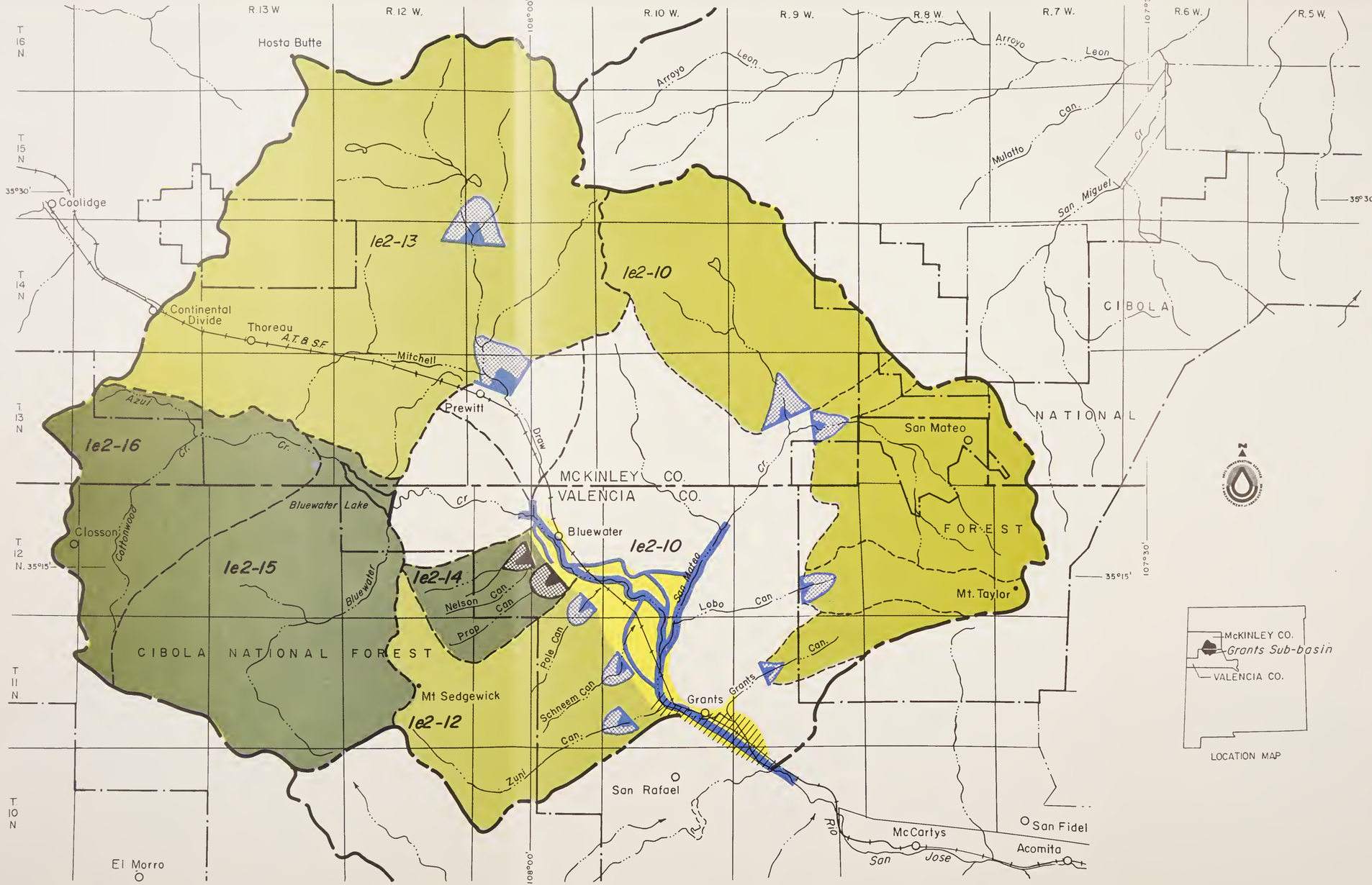
Flood control and sediment reduction measures in the San Mateo-Grants Canyon Watershed include a land treatment program designed to improve vegetative cover conditions which will reduce runoff and erosion. Structural measures recommended for flood control consist of four floodwater retarding structures and a major bypass channel around Grants. These structural measures have an average annual cost of about $95,200 and will provide project benefits in the amount of approximately $111,600. The benefit-cost ratio is estimated to be 1.2 to 1.

The following three watershed reports are on watersheds which have progressed beyond the watershed investigation stage and will be considered apart from the other watersheds.

Sandias and Belen-Los Lunas Watersheds have both been authorized for planning and the Corrales Watershed has been authorized for operations under the Public Law 566 watershed act.

U.S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE



LEGEND

- Watershed Project Boundary
- Watershed Boundary
- Subwatershed Boundary
- Lower Boundary of Interrelated Area
- County Boundary
- Area Benefited
- Urban Area Benefited
- Area Controlled by Existing Structure
- Area Controlled by Potential Structure
- Irrigation Canal
- Potential Channel Improvement
- Existing Reservoir
- Existing Floodwater Retarding Structure
- Potential Floodwater Retarding Structure
- Stock Pond
- le2-13 Conservation Needs Inventory WS. No.

LOCATION MAP

WATERSHED INTERRELATIONSHIP
GRANTS SUB-BASIN
UPPER RIO GRANDE BASIN
NEW MEXICO

OCTOBER 1970

4 0 4 8 MILES

SCALE 1:250,000

M7-N-21822

Sandias Watershed

CNI #1-131

This watershed is located on the east side of the Rio Grande. The south boundary is about 5 miles north of Albuquerque and the north boundary is just south of Tonque Arroyo. Numerous arroyos and several canyons flow from the slopes of the Sandia Mountains to the Rio Grande. Since development of the valley area, only one drainage has a channel directly into the Rio Grande.

Land treatment systems include measures designed to improve vegetative cover conditions to achieve maximum stability in erosion and runoff from the upper portion of the watershed. It has been determined that 15 floodwater retarding structures, one floodwater diversion, and associated outlet channels and improvements will afford a desired level of protection. The dams and reservoirs are planned as single purpose flood control structures; however, permanent storage could be provided in some structures for recreation, municipal, and industrial use subject to New Mexico water rights regulations. The proposed structural measures and the completed structures on the Bernalillo pilot project will control about 66 percent of the watershed. It is estimated that flood damages will be reduced about 90 percent.

Floodwater and sediment damages in this watershed occur to crops, pasture, urban developments, irrigation facilities, and roads and bridges. The average annual damages without the project are estimated to be $255,500. With the project measures installed, these damages could be reduced to $28,500. The resulting damage reduction benefits would be $227,000. Other project benefits result from redevelopment and secondary sources. Redevelopment benefits are estimated to be $61,700 and secondary benefits $31,900. Total project benefits are estimated to be $320,600 and total annual costs of structural measures are expected to be about $295,600. These benefits and costs will provide a benefit-cost ratio of 1.1 to 1.

Corrales Watershed

CNI #1-130

The Corrales Watershed is located west of the Rio Grande in Sandoval and Bernalillo Counties, New Mexico, and covers an area of 85.5 square miles, or 54,720 acres. The community of Corrales is in the downstream portion of the watershed and is located about 10 miles north of Albuquerque. The watershed work plan has been completed and authority for installation of project has been given. The local sponsoring organization has obtained most of the land easements and rights-of-way needed for the installation of structural measures.

The information on this watershed is included here to indicate the relative importance it will have on the total development of the basin. In 1941,

approximately 400 acres of irrigated land were flooded including some homes, small businesses, the Corrales Main Canal and State Road 46. The 400 acres flooded are used mainly for alfalfa, orchards, vineyards, corn, and vegetables.

The estimated average floodwater damage in the watershed under future conditions without the project is $55,000. Average annual damage from sediment is estimated to be $12,290 under future conditions without the project. The watershed work plan indicates that one floodwater retarding structure and two floodwater diversions would be needed to provide the desired level of protection at the least cost. These structural measures will reduce the evaluated flood damage by approximately 98 percent. The average annual cost of structural measures is $128,880 and average annual benefits will be $202,100 and will provide a benefit-cost ratio of 1.6 to 1.

Belen-Los Lunas Watershed
CNI #1-116

The Belen-Los Lunas Watershed is located in Belen and Valencia Counties, and covers an area of about 69,670 acres. Approximately 21,000 acres of irrigated cropland is in the watershed. The remainder is in rangeland and miscellaneous lands. This watershed has been authorized for planning and work plan development is underway. The summary of this watershed investigation report is included here to indicate the need and relative impact it will have on the total basin resources use and development. Major problems are floodwater and sediment damages to irrigation canals, irrigated cropland and business and urban developments. A severe storm and damaging flood in Belen in June 1969 emphasized need for the project. The local people are most anxious to get the project planned and installed. It is recommended that the project consist of a comprehensive land treatment program on the upper watershed areas designed to improve vegetative cover and reduce runoff and erosion. This will be supplemented by four long dams to control all of the small arroyos contributing to floodwater and sediment damages. Inasmuch as the watershed is authorized for planning under Public Law 566 and planning for flood control works is in progress, cost estimates and structure data have not been made and will not be a part of this summary; however, it is the opinion of planning technicians that the watershed project will be physically and economically justified.

The estimated cost of applying needed land treatment to watershed lands is about $631,000. This cost converted to an annual equivalent and the annual cost of operation and maintenance amounts to approximately $82,400. Average annual returns on land treatment are estimated to be $200,000.

III. OTHER EARLY ACTION NEEDS

National Forest Development Program and Project Work Inventory

The development program includes the resource management and development work needed on the National Forests to assure that these public lands will contribute their full share of present and future public needs.

The program focuses on renewable resources of the National Forest System: water, timber, forage, recreation, and wildlife habitat. It provides for the continued orderly use and development of these renewable resources in accordance with the basic conservation principles under the Multiple Use-Sustained Yield Act of June 12, 1960. The program will be carried out as rapidly as possible within the overall budgetary requirements and financial resources of the federal government.

The Project Work Inventory (PWI) for 1967 lists non-recurrent work which should be initiated on the National Forests to meet estimated public needs. The basis for determination of these needs was (1) approved management and development plans and (2) the knowledge, vision and judgment of resource managers in the field.

Needs in the El Rio en Medio Subbasin as indicated by the PWI include revegetation of 203,000 acres, sheet erosion control on 25,300 acres, control of 2,500 miles of gullies to prevent erosion, stabilize 1,070 miles of abandoned roads and trails, stabilize 30 miles of streambank for erosion control, and provide 435 acres of sediment basins.

To manage the range resource more effectively, about 890 miles of fence and 585 domestic stock and wildlife watering facilities are needed.

The timber resource can benefit by treatment of 52,000 acres, and fuel treatment is needed on 22,000 acres.

Recreational development of 1,700 acres and improvement of 18 miles of stream for fish habitat is estimated to be needed.

Proper and efficient administration of all resources is dependent to a great extent on an adequate transportation system. Such a system will require construction and betterment of about 1,600 miles of roads and trails.

The cost of these programs is estimated to be in excess of 50 million dollars.

Holy Ghost picnic area, Jemez Pueblo enterprise

FS PHOTO

Typical picnic "set", U. S. Forest Service

FS PHOTO

RECREATION AND TRANSPORTION MAP
RIO EN MEDIO SUB-BASIN
UPPER RIO GRANDE BASIN
NEW MEXICO

Recreation

Recreation use is expected to about double by 1980. Additional recreational facilities will be required to accommodate this increase. An estimated total of 5,000 acres of land will be required to satisfy the demand for developed area use.

In 1968, an estimated 4,500 acres of land, 17,000 surface acres of water, 290 miles of stream, and 70 miles of trail were available for recreational use. The big game population in El Rio en Medio Subbasin is estimated to be 300 elk, 45,000 deer, 700 antelope, 100 bear, and 1,500 turkeys.

Existing and planned recreational developments will be adequate to satisfy the estimated needs of the subbasin for 1980. Table 4 is a listing of the recreation use in the subbasin in 1968 and expected use in 1980. Table 5 is a listing of use and needs for developing recreational areas, expressed in acres. No attempt was made to project needs for dispersed area uses. Generally all areas are available for dispersed activities and uses can only be more intensified.

Land Treatment

Good management, vegetative manipulation, and mechanical land treatment are methods by which the land can be induced to contribute more to the subbasin economy. Land treatment can be planned so the El Rio en Medio study area will produce more forage, timber, water, and food. The same land treatment can reduce the amount of damaging sediment and provide for wide-scale employment of local people. Table 6 estimates land treatment impacts from land subject to United States Department of Agriculture programs. The land treatment map portrays the land treatment and vegetation areas in the subbasin.

Approximately one and three-fourth million acres are critically eroded and special methods are needed to reduce erosion and restore the area to productive use. These areas of critical erosion need a system of land treatment that includes the proper combination of the following practices: livestock exclusion or limited livestock use, gully control, water spreading or erosion control devices, grazing land mechanical treatment, fencing, relocation of watering points, intensive vegetative management, and critical area seeding.

Of the 5 million acres of grassland, 2,913,000 acres need better range management to realize its economic potential. Treatment will include the proper combination of these practices: deferred grazing, rotation-deferred grazing, proper grazing use, and better livestock distribution with fences and water locations.

Table 4, Present and projected recreation use, El Rio en Medio Subbasin (visitor days 1,000's)

Activity	Existing use 1970			*Projected use 1980		
Developed sites	National Forest	Other	Total	National Forest	Other	Total
Observation	10.1	31.6	41.7	36.3	46.3	83.1
Playgrounds, sports	-	-	-	-	-	-
Swimming	-	5.1	5.1	-	7.5	7.5
Campgrounds	32.5	80.0	112.5	125.4	118.3	247.3
Picnic grounds	29.6	120.0	149.6	116.2	177.6	293.8
Hotel, Lodge, Restr.	-	6.3	6.3	-	9.3	9.3
Organizational	-	2.0	2.0	-	2.9	2.9
Comm. services	-	6.3	6.3	-	9.3	9.3
Rec. res. sites	5.3	-	5.3	20.4	-	20.4
Winter sports	-	-	-	6.4	-	6.4
Visitor centers	-	-	-	-	-	-
Subtotal	77.5	251.3	328.8	304.7	371.7	676.4
Dispersed areas						
Roads (rec.)	78.5	-	78.5	300.8	-	300.8
Trails (rec.)	7.1	63.2	70.3	27.5	93.4	120.9
Streams	.4	94.7	95.1	1.2	140.2	141.4
Lakes	4.0	315.7	319.7	14.4	467.2	481.6
General undeveloped	69.3	269.3	338.6	261.0	398.5	659.5
Subtotal	159.3	742.9	902.2	604.9	1099.3	1704.2
Grand total	236.8	994.2	1231.0	909.6	1471.0	2380.6

*NFRS-BOR projections

Table 5, Present and projected recreation use and land needs, developed areas

Activity	Present use 1970			Projected use 1980	
Developed sites	Visitor days (1,000s)	Land needs (acres)	Conversion factor	Visitor days (1,000s)	Land needs (acres)
Observations	41.7	33	.0008	83.1	66
Playgrounds, sports	-	-	-	-	-
Swimming	5.1	16	.0032	7.5	24
Campgrounds	112.5	1012	.0009	293.8	2644
Hotel, lodge, restr.	6.3	11	.0017	9.3	16
Organizational	2.0	5	.0025	2.9	7
Comm. service	6.3	11	.0017	9.3	16
Rec. res. sites	5.3	15	.0027	20.4	55
Visitor centers	-	-	-	-	-
Winter sports	-	-	.0035	6.4	22
Total	328.8	2448		676.4	5043

Ranchers clearing juniper-invaded rangelands SCS PHOTO

Table 6, Land treatment needs and impacts (1969-1980), El Rio en Medio Subbasin

Land treatment systems	Needs treatment (acres)	Total treatment cost $	Impacts - Average annual value: Water $	Sediment reduction $	Red Meat $	Timber wood $	Cultivated land $	Increased net income $	Employment man-years
1. Grassland									
1b-Snowpack mgt.	136	93,100	125,400	-	-	-	-	125,400	7
1c-Good range mgt.	2,913,000	1,456,500	-	195,400	1,656,000	-	-	1,851,400	138
2. Woodland									
2a-Pinyon-juniper control	627,000	10,659,000	-	11,500	564,300	-	-	575,800	800
2b-Pinyon-juniper mgt.	1,513,000	15,130,000	-	50,700	906,200	-	-	956,900	1,135
3. Brushland									
3a1-Sagebrush con.	3,000	36,000	-	300	6,700	-	-	7,000	3
3b1-Sagebrush mgt.	75,000	1,125,000	-	5,300	168,700	-	-	174,000	84
3a2-Chaparral con.	3,000	18,000	343,700	300	3,400	-	-	347,400	1
3b2-Chaparral mgt.	21,000	157,500	-	1,500	23,600	-	-	25,100	12
3a3-Creosote brush control	43,000	516,000	-	4,900	96,700	-	-	101,600	39
3b3-Creosote brush mgt.	103,000	1,236,000	-	7,200	231,700	-	-	238,900	93
3a4-Mesquite brush control	75,000	750,000	-	8,600	67,500	-	-	76,000	56
3a5-Rabbitbrush control	32,000	480,000	-	3,700	72,000	-	-	75,600	36
3b5-Rabbitbrush mgt.	33,000	495,000	-	2,300	73,800	-	-	76,100	37
4. Commercial timber									
4a-Spruce-fir mgt.	32,000	1,280,000	117,300	1,600	36,000	126,400	-	281,300	96
4b-Ponderosa pine mgt.	191,000	5,730,000	175,000	9,300	214,900	735,300	-	1,134,500	430
4c-Aspen mgt.	3,000	90,000	11,000	100	3,400	700	-	15,200	7
5. Bottomland									
5a-Phreatophyte control	27,000	810,000	891,000	-	243,000	-	-	1,134,000	61
5b-Bottomland mgt.	16,000	160,000	-	-	36,000	-	-	36,000	12
6. Cultivated									
6a-Irrigated									
6a1-Drainage	28,140	562,800	-	-	-	-	2,110,500	2,110,500	42
6a2-Imp. irrigation	59,760	6,573,600	-	-	-	-	4,482,000	4,482,000	493
6b-Dryland	110	2,200	-	-	-	-	400	400	-
6c-Abandoned cropland	11,000	165,000	-	100	99,000	-	-	99,100	12
7. Critical erosion area	1,785,000	26,775,000	-	755,700	-	-	-	755,700	2,008
Totals		74,300,700[1/]	1,663,400	1,058,500	4,502,900	862,400	6,592,900	14,680,100	5,602

1/ Total treatment cost converted to annual equivalents is $6,600,000

LEGEND

1	GRASSLAND MANAGEMENT
2	PINYON-JUNIPER MANAGEMENT
3-1	SAGEBRUSH MANAGEMENT
3-2	CHAPARRAL MANAGEMENT
3-3	CREOSOTEBUSH MANAGEMENT
3-4	MESQUITE MANAGEMENT
3-5	SAND SAGEBRUSH MANAGEMENT
3-6	RABBITBRUSH
4a	SPRUCE-FIR MANAGEMENT
4b	PONDEROSA PINE MANAGEMENT
4c	ASPEN MANAGEMENT
5	BOTTOMLAND VEGETATION MANAGEMENT
6a	IRRIGATED CROPLAND MANAGEMENT
6b	DRY CROPLAND MANAGEMENT
6c	MANAGEMENT OF LAND PREVIOUSLY CULTIVATED — NOT WELL VEGETATED
8	CRITICAL EROSION AREA MANAGEMENT (These areas from the Gross Erosion Map and are > 1 acre-foot/sq. mi./year sediment producers)

Scale 5 0 5 10 15 Miles

LAND TREATMENT MAP
RIO EN MEDIO SUB-BASIN
UPPER RIO GRANDE BASIN
NEW MEXICO
JULY 1970

Brush control using machinery

SCS PHOTO 12-P830-2

Brush control results

SCS PHOTO 12-P830-6

FS PHOTO

Grass seeding results after clearing pinyon-juniper near Magdalena

About 11,000 acres of land which were formerly cropped have been abandoned and are producing about 15 percent of potential. These abandoned fields need to be reseeded and erosion control measures installed to give the areas a chance to recover and stabilize.

Of the more than two million acres of pinyon-juniper woodlands needing treatment, more than one-fourth have moderately deep soils and moderate slopes upon which a woodland control program can be developed. The other three-fourths of the area need good range management supplemented by selective thinning and spot clearing where adaptable.

About 18,000 acres of big sagebrush, 24,000 acres of chaparral, 146,000 acres of creosote bush, 75,000 acres of mesquite, 60,000 acres of sand sagebrush, and 65,000 acres of rabbitbrush need treatment. About 127,000 acres can be cleared and reseeded to grass and the rest managed by using intensive management techniques including deferred grazing, rotation deferred grazing and better livestock distribution through use of fences and water locations.

There are 226,000 acres of commercial timberland in the basin that need treatment. Depending on vegetation type, management practices include block and strip cutting, selective cutting, thinning, tree planting, fire protection, grass seeding, erosion control on trails and roads, proper grazing use, and wildlife habitat improvement.

About 43,000 acres of bottomland vegetation along the main stem of the Rio Grande and its principal tributaries need treatment. These are phreatophytes that have little beneficial use. Twenty-seven thousand acres need to be cleared and replanted to adapted grasses. About 16,000 acres should be managed for wildlife habitat, streambank protection, and recreation areas.

There are about 65,000 acres of irrigated land and 100 acres of dry cropland that need treatment. On irrigated land drainage is needed on 28,000 acres and 60,000 acres need improved irrigation systems that include land leveling, sprinkler systems, pipelines, ditch lining, and realigning field ditches.

SCS PHOTO 12-P287-3

Net wire diversion - erosion control on Rio Puerco Drainage

Agricultural Water Management

Irrigation along the Rio Grande and its tributaries has been practiced for more than 900 years. The Pueblo Indians who occupied the valley prior to the time of Spanish exploration used simple irrigation systems and methods. Development along the Rio Grande was well established in the early seventeen hundreds. It is reported that maximum irrigation development occurred in 1880 when 124,800 acres were developed. For the next 40 years the acreages irrigated declined. Initially all irrigation in the area was from surface water. In recent years, groundwater sources have also been developed for irrigation. Much of the irrigation considered in this report uses a combination of surface and groundwater.

Irrigation throughout the state of New Mexico accounts for about 90 percent of the annual depletion for beneficial uses of the state's surface and groundwater supplies. 1/

Mean annual runoff of contributing streamflow from the area considered in this report is relatively insignificant. Mean annual runoff of contributing streamflow varies from less than 0.1 inch over most of the area to about 2 inches in the Manzano Mountains and 5 inches on Mount Taylor. 2/

Irrigated farming acreage distribution is as follows:

Main stem of Rio Grande	80,860 acres
Tributaries	13,960 acres
Total	94,820 acres

Except for the Rio Grande Valley and near Bluewater, surface waters are diverted and delivered by private or community ditch systems. These small systems are inefficient in operation and the delivery of water.

In the Grants-Bluewater area, the surface water is controlled and delivered by the Bluewater-Toltec Irrigation District. Of the approximately 5,488 acres of water rights in the area, uranium companies are using about 60 percent of the water rights. Much of the area, including uranium interests, use supplemental groundwater. To be effective and efficient as an irrigation water delivery system, reorganization and rehabilitation of the ditches need to be accomplished. The surface water used in the irrigation district comes from Bluewater Creek which has the Bluewater reservoir as a storage facility. The groundwater supply is from the Bluewater Basin which is an underground water basin declared by the New Mexico State Engineer.

1/ Consumptive Irrigation Requirements of Selected Irrigated Areas in New Mexico - NM State U. Ag. Experiment Sta. Bulletin 531, Aug. 1968.

2/ Characteristics of the Water Supply in New Mexico. New Mexico State Engineer Tech. Report 31 (1965).

Poor water management

SCS PHOTO 12-P615-16

Good water management

SCS PHOTO 12-P615-14

During the early part of the 1900's unsuccessful attempts were made to secure a program to rehabilitate the irrigated areas along the Rio Grande. Continued deterioration of valley lands finally caused community action that resulted in the formation of the Middle Rio Grande Conservancy District in 1925. By 1936, the district had constructed works to serve 118,000 acres.

A comprehensive plan for the Middle Rio Grande Valley, approved by Congress in 1948, authorized the U. S. Bureau of Reclamation to do the following:

1. Irrigation and project rehabilitation of the Middle Rio Grande Conservancy District.

2. Rehabilitation of El Vado Dam and diversion dams.

3. Drainage rehabilitation and extension.

4. Rectification of the channel of the Rio Grande in the Middle Valley including the Espanola Valley, and the reach from Elephant Butte Dam to Caballo Reservoir.

At present the Conservancy District operates and maintains the following:

1. One storage dam and reservoir (El Vado)

2. Four diversion dams

3. Five drainage wells

4. 202 miles of unlined main canal

5. One-quarter mile of concrete-lined main canal

6. 578 miles of unlined laterals

7. 393 miles of open drains

8. 250 miles of maintained levees

9. 186 miles of maintained river channel

The outlet works at El Vado Dam were recently modified to permit the passage of San Juan-Chama Project waters through El Vado Reservoir as required to satisfy the Rio Grande compact schedules of water delivery and to insure non-impairement of existing water rights.

Many of the unlined laterals and on-farm laterals and head ditches could serve the water user better if they were concrete lined. To best accomplish the needed reorganization of ditches and laterals, a joint effort in planning and installation by the conservancy district, state and federal agencies would be advantageous.

Even though 393 miles of open drains are in use, many acres of choice farmland have a high water table. This problem is causing reduced crop production on these lands. To solve this problem a comprehensive program should be initiated to drain areas seriously affected by a high water table. The program should be carried out to meet the needs for drainage on individual farms and local problem areas. The program should be planned and executed by a joint effort of the local people and state and federal agencies.

The Practice of Irrigation - Irrigation efficiency is often defined as the percentage of water applied to the land expressed in harvested (or harvestable) crops. The improvement of irrigation efficiencies is the most critical need in the conservation of water supplies. The major problems of crop production are poor management of irrigation systems and poor farming practices. With the rising costs of production and the scarcity of water for irrigation in the Rio Grande Valley, these problems will assume greater importance in the future. Irrigation efficiencies can be increased by reducing the losses of water in conveyance runoff, deep percolation, and evaporation. Israelsen stated that:

> *"Because of the many sources of loss of irrigation water between the time and place of diversion and where it is stored in the root zone soil as water readily available to plants, the irrigation efficiency on most projects is low, probably less than 33 percent."* 1/

Sprinkler irrigation, lining of canals and/or laterals, and pipelines for water delivery would help improve farm irrigation efficiencies up to 70 percent for a well-managed system.

Commonly used estimates for farm irrigation efficiencies in New Mexico range from about 30 to 50 percent. Some speculations on the significance of irrigation efficiencies in the El Rio en Medio Subbasin are shown in the table.

This analysis indicates that, if the farm irrigation efficiency could be raised from 50 to 70 percent, 113,760 acre feet less water would be required to be delivered at the farm headgate. Further, if it were assumed that transportation losses amounted to 30 percent of the water diverted, then the diversion requirements for irrigation in the area would be decreased by 162,500 acre feet annually or an average of about 1.7 acre feet per acre. Not all of the 162,500 acre feet of water is lost to the basin, but may be recoverable by return flow to the streams or from wells. However, some of the water may be lost to the basin through consumptive use of riparian vegetation and evaporation from wetted soils, swamps, and open water areas. The amount of water consumed by these uses is not known, but if it were assumed that one-third of the 162,500 acre-feet would be depleted and that water had a value of $22.00 an acre-foot, the average

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1/ Irrigation Principles and Practices, Orson W. Israelsen, PhD.

annual savings would be about $1,191,700; and, at $50/acre-foot, the average annual savings would be about $2,707,500. The following tabulation gives the total diversion requirement for various farm irrigation efficiencies and the value of water saved annually.

In addition to these losses, there are definite losses to the farmer and the community when irrigation efficiencies are low. These are:

(1) Fertilizers leached or washed away,
(2) Pollution of stream and underground water,
(3) Varying the water table and increasing necessary drainage,
(4) Loss of use of land due to high water table,
(5) Loss of topsoil due to erosion, and
(6) Cost of fighting mosquitoes.

In most areas of the subbasin soil conditions are such that subsurface drains can be installed and effectively lower the water table. Either open, closed, or a combination of open and closed drains can be effective. In some localized areas of channel aggradation, it may be necessary to pump drainage water into the river.

Concrete-lined irrigation canal saves water, moves it faster, reduces labor and decreases maintenance cost. SCS PHOTO 12-P614-10

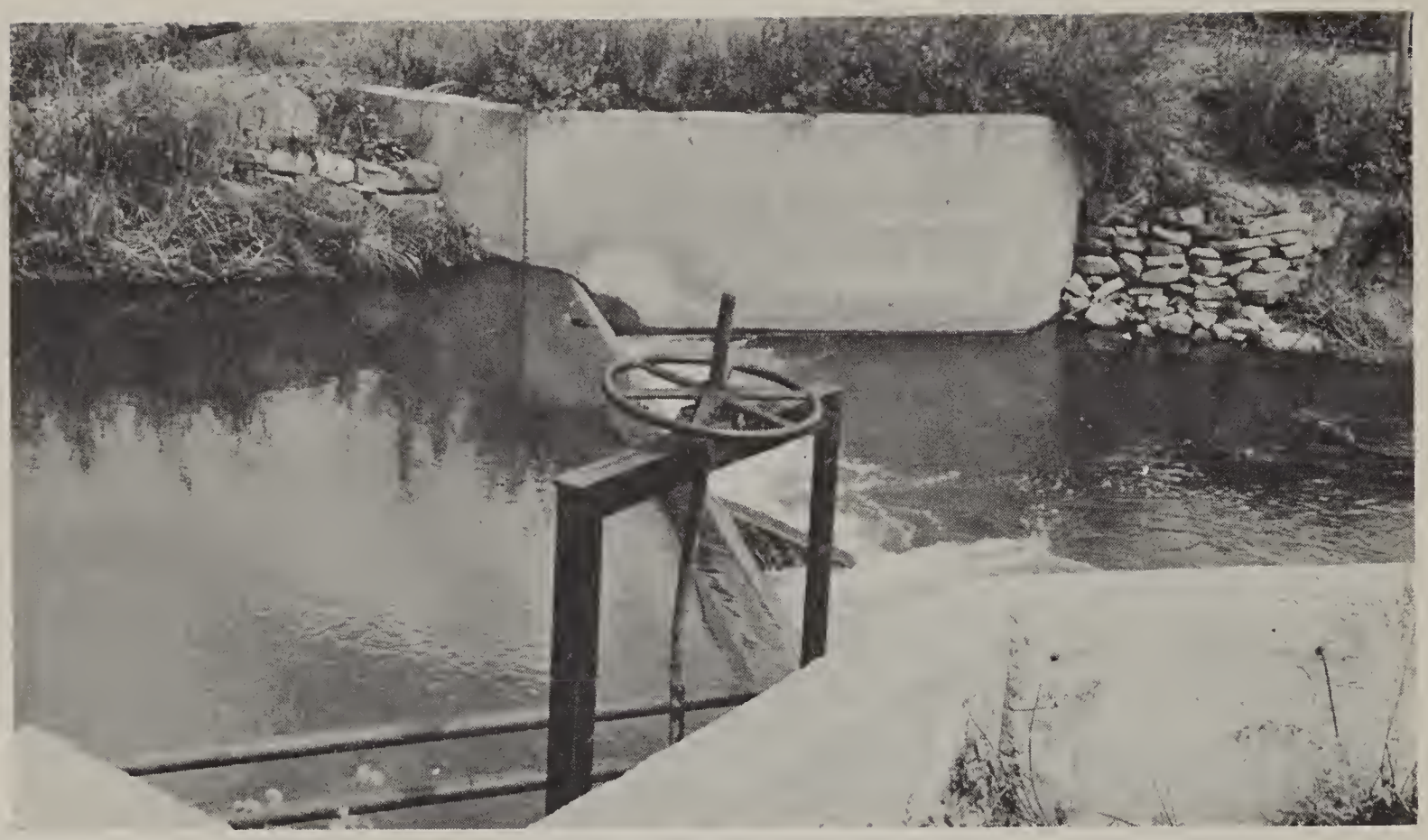
Table 7, Significance of irrigation efficiencies in the El Rio en Medio Subbasin (94,800 acres)

Farm irrigation efficiency	Total farm delivery requirement	Difference in diversion requirement	Average annual savings in $1,000			
			1/	2/	3/	4/
%	(acre-feet)	(acre-feet)				
30	658,000					
40	493,500	49,300	1,084,600	2,465,000	12,325,000	147,000,000
50	394,800	78,960	1,373,100	3,948,000	19,740,000	236,880,000
60	329,000	98,700	2,171,400	4,935,000	24,675,000	296,100,000
70	282,000	112,800	2,481,600	5,640,000	28,200,000	338,400,000
75	394,000	118,440	2,605,600	5,922,000	29,610,000	355,320,000

1/ Water valued at $22.00 per acre-foot (value if used for irrigation in Upper Rio Grande Basin)
2/ Water valued at $50.00 per acre-foot (estimated value of water in the Elephant Butte Reservoir)
3/ Water valued at $250.00 per acre-foot (recreation use)
4/ Water valued at $3,000 per acre-foot (municipal and industrial use)

Assumptions:

Irrigation acreage equals 94,800 acres
Acreage consumptive irrigation requirements equal 2.1 acre-feet per acre.



Irrigation pipeline used to increase irrigation efficiency SCS PHOTO 12-P560-15

Municipal and Rural Domestic Water [1/]

Water Quality

There are thirty-nine communities in the El Rio en Medio area with populations in excess of one hundred people. The quality of water supplies in these communities is generally very hard. The ratings are as follows:

Very hard	28 communities out of 39
Hard	4 communities out of 39
Moderately hard	5 communities out of 39
Soft	2 communities out of 30

Specific mineralization of water which exceeds New Mexico State Health Department standards are noted as follows:

Water high in iron - Communities of Lemitar, Los Ranchos de Albuquerque, Magdalena, Paradise Hills, Skyview Acres, Thoreau, and Tijeras.

1/ The Nation's Water Resources Summary Report, United States Water Resources Council, 1968.

Municipal Water Supplies and Uses-Northwestern New Mexico, Tech. Report 29C, New Mexico State Engineer, Santa Fe, New Mexico

Water high in dissolved salts - Bluewater, Cubero, Encinal, Lemitar Mesita, Old Laguna, Paraje, Polvadera, and Seama.

Water high in nitrate - Communities of Polvadera and Vegueta.

Water high in sulfate - Communities of Bluewater, Encinal, Grants, Lemitar, Mesita, Old Laguna, Paraje, Polvadera, San Antonio, San Rafael, and Seama.

Water Quantity

Municipal and rural domestic water needs and consumptive use for the area are projected as follows:

Year	Communities with population of more than 100 (acre-feet/day)	Communities with population less than 100 & rural (acre-feet/day)	Total
	NEEDS		
1970	190.62	5.06	195.68
1980	330.30	6.10	336.40
	CONSUMPTIVE USE		
1970	103.30	3.54	106.84
1980	199.92	4.07	203.99

Water and Sewerage Development Needs

The population of the area is calculated and projected to be as follows:

Year	Municipal (communities with 100+)	Rural (and communities with less than 100)	Total
1965	336,300	30,500	366,800
1970	400,700	31,100	431,800
1980	566,400	33,100	599 500
1990	757,400	35,100	792,500
2000	996,300	37,900	1,034,200
2010	1,286,100	41,100	1,327,200
2020	1,627,800	45,300	1,673,100

The projections of population give an indication of the future demands for community water and sewage developments, and of the private water and sewerage needs in the rural sectors of the area.

In 1969, the water and sewerage needs of the thirty-nine communities were analyzed as follows:

Clear mountain stream

FS PHOTO

Silt laden river

RBFP PHOTO

Community water systems are needed for 14 of the 39 communities. Water systems are being planned for 8 of the communities. Community sewerage systems are needed in 21 of the 39 communities. Of the 21 needed, 10 are currently being considered or planned.

Projected increasing population and the corresponding increase in water needs, points out the nature and magnitude of the water and sewerage development needs. These are expressed in dollar costs as follows for the early action period.

1. For the "Early Action Period" (now until 1980), the objectives of local community leaders of providing a safe and healthy environment for the local people through community water and sewerage systems are summarized as follows:

   a. The population is predicted to grow from 366,800 to 599,500 people, an increase of 232,700 people. (By the year 2020, the population is predicted to grow to 1,673,100 people, an increase of 1,306,300).

   b. To bring all communities and the rural population up to an 80 percent "hook-up level" for residents, and to keep pace with the expanding poulation, there will need to be a total expenditure of $100,046,000.

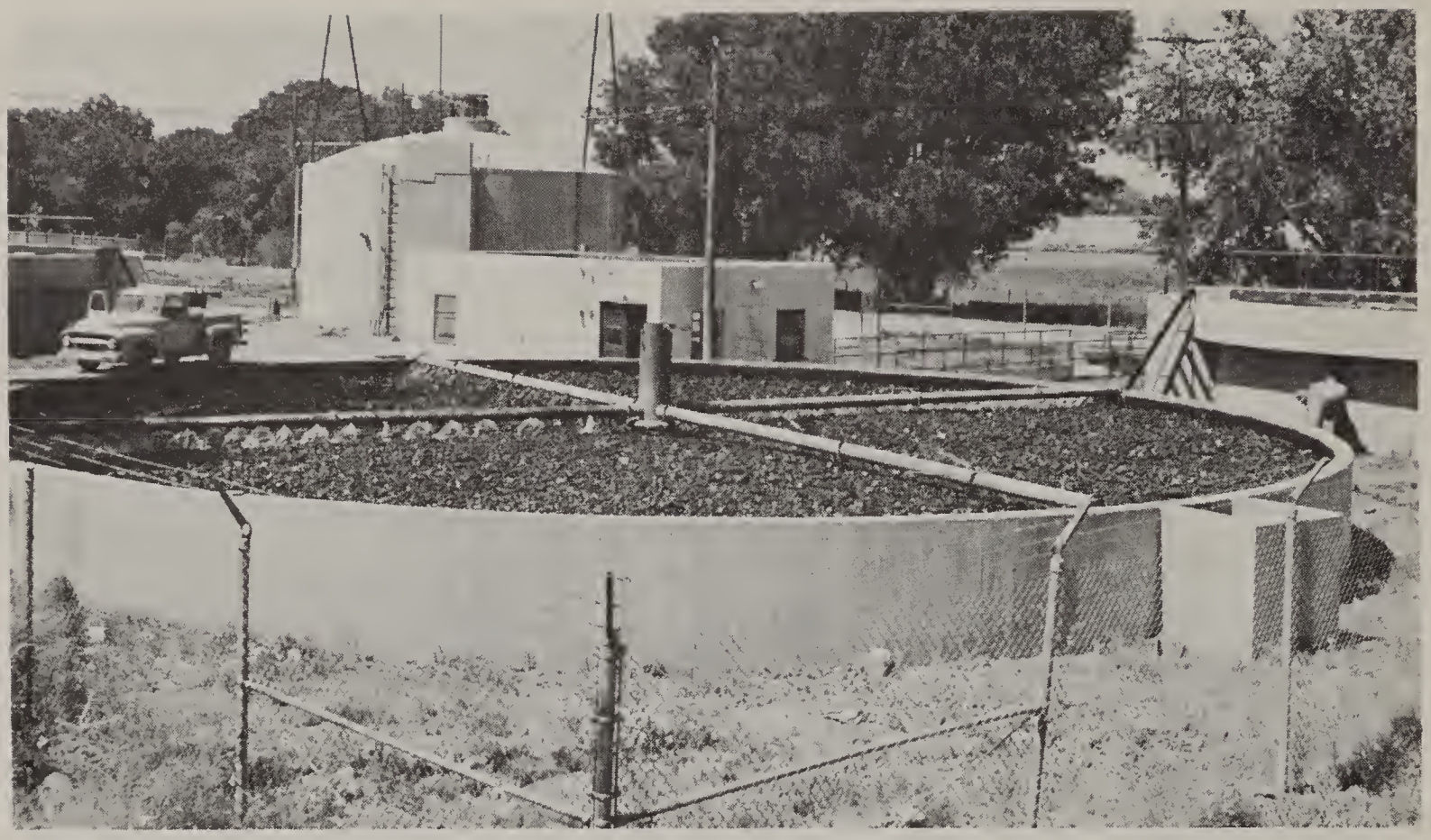
   c. Assistance is available to the local people of communities of more than 100 persons and less than 5,500 people from the Farmers Home Administration through Public Law 660. The potential for such assistance is approximately $3,195,000. This is on the basis of sharing 30 percent of the cost. In addition, the state of New Mexico offers cost-share assistance up to $12,000 per community. The potential for such assistance is $240,000.

   d. If the federal and state assistance is utilized to the maximum, the local people will still have a total expenditure of $96,611,000 as their share of the cost of water and sewerage development.

2. The water and sewerage development needs are: Total for 1970 is $40,323,000 and for 1980 the total is $59,723,000.

Under certain conditions, local sponsors can obtain loans and grants up to 50 percent of the development cost of a water or waste disposal system under USDA's Public Law 87-128 (amended by PL 89-210) and Public Laws 87-703 and 660. These laws are administered by the Farmers Home Administration. Other sources of assistance are available as follows:

A. Water and sewerage facilities grants from the U. S. Department of Housing and Urban Development (Public Law 87-117). This program provides grants of up to 50 percent of cost of land and construction of new water and sewerage facilities.



Sewage treatment plant, Socorro, New Mexico SCS PHOTO 12-P991-15

B. Program of grants of up to 50 percent and loans which may run as long as 50 years with Economic Development Administration (PL 89-136).

C. Loans up to 40 years for 100 percent of cost under Department of Housing and Urban Development (PL 84-345)

D. Grants ranging from 30 to 60 percent of costs for water treatment works through Water Pollution Control Administration.

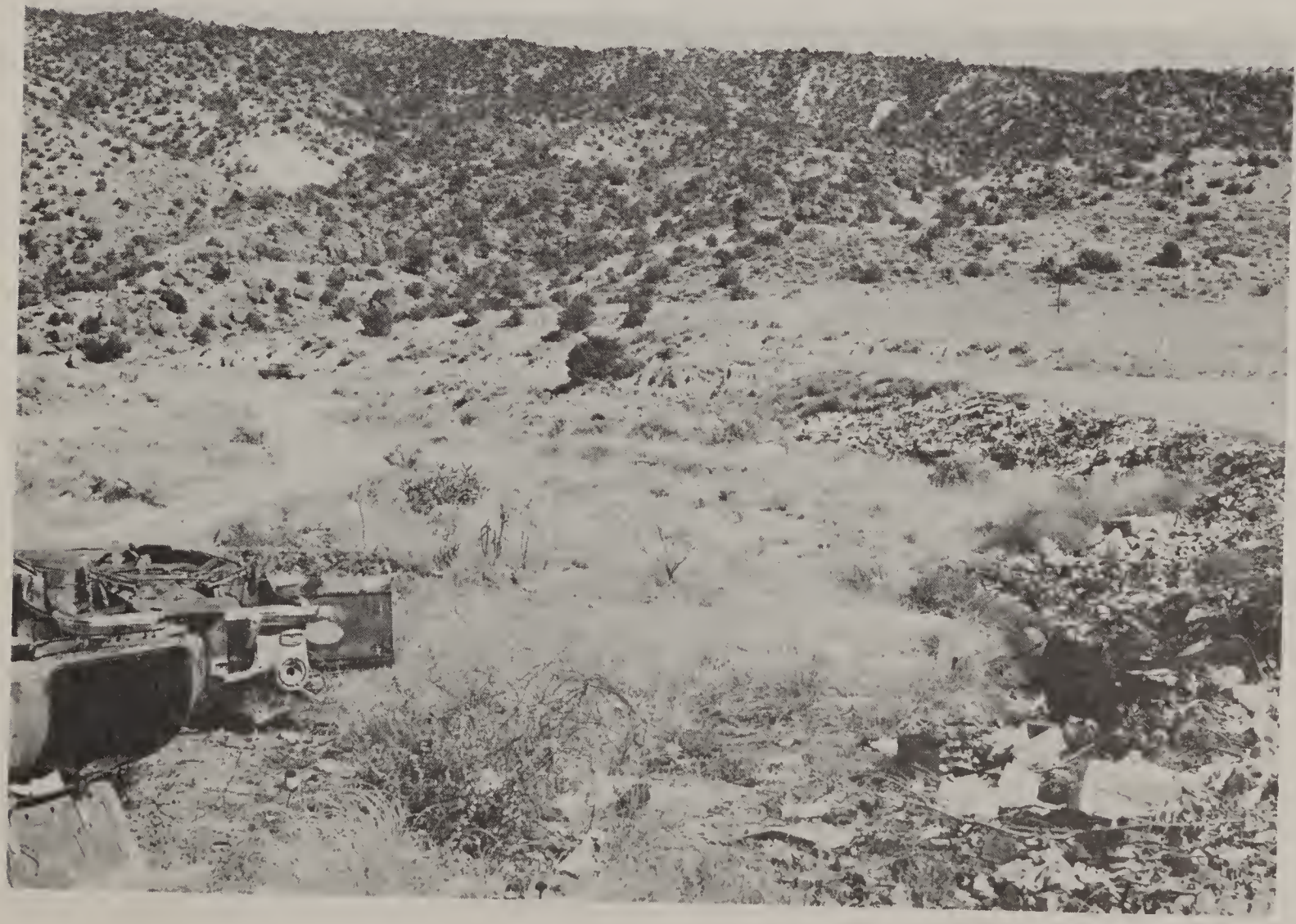
The quantity of water in groundwater reservoirs underlying 36 of the 39 communities mentioned is adequate for projected population needs through 1980. Detailed studies will be needed for 3 of the 39 communities in order to determine adequacy of groundwater resources. These are Acoma Pueblo, Tijeras, and Magdalena. Most of these communities are in a declared underground water basin; therefore, existing water rights will have to be retired to offset any new depletions required to satisfy community needs.

Industrial Water

Demands for industrial water will vary in types of industries to be attracted to the area, relationship of industry to transportation systems, labor supplies, local initiative, and other factors -- thus, it would be difficult to "pin-point" locations to any exact degree. Projections for demands and consumptive use of industrial water are thus based on relationship of industrial water to municipal waters. Projections are as follows:

SCS PHOTO 12-P591-9

Solid Waste Disposal is an ever-present problem.



SCS PHOTO 12-P591-7

Year	Projected industrial water needs (demand) (acre-feet/day)	Projected industrial water needs (consumptive use (acre-feet/day)
1970	103.04	16.11
1980	181.24	26.42

Water for Power - Demands for water used in power generation follow the projected population increase. The projections developed reflect water demands for power whether generation is within or without the area. Projections are as follows:

Year	Projected power water needs (demand) (acre-feet per day)	Projected power water consumptive use (acre-feet per day)
1970	772.19	16.13
1980	1801.67	36.12

Solid Wastes - An ever-present and ever-increasing problem is the disposal of solid wastes. Indiscrimate dumping creates health hazards, adversely affects the quality of water from the area, is offensive to sight and smell and deters recreation and other desirable land uses. An approach to the problem is enactment and enforcement of strict laws prohibiting dumping of waste material at other than designated locations provided under the same law.

Public Law 87-703, Resource Conservation and Development Program

One of the basic objectives of the Resource Conservation and Development (RC&D) Program is the orderly development, improvement, conservation, and utilization of natural resources of the project area thereby providing employment and other economic opportunities to the people of the area. The RC&D program is applicable where the acceleration of current conservation activities plus the use of other authorities will provide additional opportunities to local people.

The area included in this report is not an authorized RC&D program area, but many of the projects proposed in the preceding pages of this report could be accomplished or assisted under Public Law 87-703.

Other measures which should be considered as potential RC&D project proposals in the Early Action Program or for additional study include:

(1) Accelerated soil surveys in those areas proposed for intensive land treatment.

(2) Accelerated conservation planning in those areas proposed for intensive land treatment.

(3) Range development - need better access to rangelands and watering facilities for better livestock distribution.

(4) Christmas tree plantations which would hire people full time in the summer and provide additional employment during the winter.

(5) Grazing associations with cattle branding, pregnancy testing, and pre-conditioning of stock included in their programs.

(6) Trout stocking of lakes and ponds.

(7) Development of small industries utilizing timber cutting and sawmill waste.

(8) Development and management of wildlife habitat.

(9) Farm and ranch training for returning veterans.

The following list includes other opportunities associated with water and related land.

(1) Scenic roads along the Continental Divide.

(2) County fairgrounds and recreation centers.

(3) Volunteer fire departments.

(4) Swimming pools.

(5) All-weather school bus routes.

The above are only a few of many project measures which would benefit the socio-economics of the area.

Land Use Planning and Zoning

A real need for comprehensive land use planning is in evidence throughout the subbasin. If New Mexico has a future in industries related to the forests, mining, and the production of meat, this subbasin may prove to be the center of activity.

Land use plans need to be developed to cope with future population and economic expansion in the area. Responsibility for this type project lies with county and municipal commissioners and state and federal planners. It is desirable that subsequent zoning laws complement future plans of state and federal agencies. Zoning boards should include county commissioners and representatives for municipalities, the State Planning Office, U. S.

Forest Service, Bureau of Land Management, Bureau of Indian Affairs, and other organizations interested in total resource development of the subbasin. Items that should be considered are: (1) location for industrial growth, (2) areas for home sites, (3) restrictions on future use of floodplains to limit loss of life and property from floods, (4) location of garbage and refuse disposal areas, (5) areas for agricultural expansion, (6) locations for future highways and other transportation facilities, (7) sources of water and sewage disposal facilities for future domestic use, (8) location of school sites and other municipal, county, and state management facilities, (9) ideal water impoundment sites,(10) preservation of good agricultural land for agricultural purposes, (11) preservation of natural beauty spots and recreational sites, and (12) game management areas.

IV. SUMMARY OF IMPACTS

Some of the ideas and alternatives proposed in this report can be analyzed through a study of the monetary impact they will have on the subbasin. In table 8, the estimated average annual costs, benefits, and returns are listed for a few programs in which the United States Department of Agriculture can participate.

Other project measures such as Resource Conservation and Development programs, sewage, and water systems are recommended but benefits and economic impacts have not been analyzed.

Table 8, Economic impacts under United States Department of Agriculture programs in El Rio en Medio Subbasin, Upper Rio Grande Basin, New Mexico

Types of Measures	Early Action Opportunities: Benefits and costs: Average annual benefits for structural measures and returns on land treatment	Benefits and costs: Average annual cost	Other economic impacts: Average annual man-years of employment	Other economic impacts: Average annual increase in income
Structural 1/				
Canyon Sales	$ 126,700	$ 87,450	6	$ 24,000
Pajarito Arroyos	419,300	266,500	21	84,000
Pole-Zuni	37,000	23,900	2	8,000
San Mateo-Grants	111,600	95,200	6	24,000
San Jose	152,800	81,350	3	12,000
Hell's Canyon	420,000	325,700	24	96,000
Pino Draw	205,300	137,200	11	44,000
Sandias 3/	320,600	295,600	22	88,000
Lemitar-Polvadera	121,300	102,300	10	40,000
Walnut Creek	295,800	217,800	18	72,000
Nacimiento-Rito Leche	79,100	55,900	3	12,000
Corrales 2/	202,100	128,900	16	64,000
Belen-Los Lunas 5/	--	--	2	8,000
Subtotal	2,491,600	1,817,800	144	576,000
Land Treatment 4/	14,680,000	6,600,000	560	2,240,000
Total	$17,171,600	$8,417,800	704	$2,816,000

1/ These values are based on potential Public Law 566 projects
2/ This watershed has a completed work plan and approval for operations
3/ This watershed has been approved for planning and is now in progress.
4/ Based on total land treatment needs for the area covered by the El Rio en Medio Report.
5/ Inasmuch as the watershed is authorized for planning under Public Law 566 and planning for flood control works is in progress, estimates of structure data and costs for installation have not been made and will not be a part of this report.